

UNITED STATES OF AMERICA:
WAR DEPARTMENT.

MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

JULY, 1885.

PREPARED UNDER THE DIRECTION OF
BRIG. & BVT. MAJ. GEN'L W. B. HAZEN,
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PUBLISHED BY AUTHORITY OF THE SECRETARY OF WAR.

WASHINGTON CITY:
SIGNAL OFFICE.
1885.

LIBRARY OF CONGRESS,
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List of merchant marine steam and sailing vessels from which International Simultaneous Meteorological reports were received at the Office of the Chief Signal Officer, U. S. Army, Washington, D. C. in time to be used in the preparation of the Weather Review for the month of July, 1885.

Name of vessel.	Observers.	Name of vessel.	Observers.	Name of vessel.	Observers.
<i>Allen Line.</i>		<i>Mediterranean & N. Y. S. S. Co.—Con.</i>		<i>Wilson Line.</i>	
Br. s. s. Circassian.....	Capt. Wm. Richardson.	It. s. s. Independente.....	Capt. P. Pirandello.	Br. s. s. Chicago.....	Capt. J. W. Jones.
Grecian.....	C. E. Le Gallais.	Stura.....	Joseph Brofferio.	Marengo.....	J. H. Malet.
Siberian.....	R. P. Moore.			Otranto.....	F. Kerr.
<i>American Line.</i>		<i>Mis. & Dominion S. S. Co.</i>		<i>Winsor Line.</i>	
Br. s. s. British Prince.....	Sam. Nowell.	Br. s. s. Ontario.....	W. P. Couch.	Am. s. s. Norman.....	H. W. Googins.
British Princess.....	E. H. Freeth.	Toronto.....	Jas. McAuley.	Saxon.....	S. W. Snow.
Am. Indiana.....	R. W. Sargent.				
Br. Lord Clive.....	P. Urquhart.	<i>Monarch Line.</i>			
		Br. s. s. Assyrian Monarch.....	John Harrison.		
<i>Anchor Line.</i>		<i>Morgan's La. & Texas R. R. & S. S. Co.</i>		<i>Miscellaneous.</i>	
Br. s. s. Anchor.....	J. J. Small.	Am. s. s. Chalmette.....	Robt. B. Quick.	Ger. s. s. Brutus.....	J. A. Voegel.
Australia.....	Alex. McRitchie.			Br. Camden.....	S. H. Chandler.
City of Rome.....	R. D. Munro.	<i>National Line.</i>		Edith Godden.....	John H. Bennett.
Elysia.....	James Brown.	Br. s. s. Canada.....	Wm. Pearce.	Ivanhoe.....	John Cameron.
Ethiopia.....	John Wilson.	Greece.....	Thos. Foote.	Lord O'Neill.....	James Dunn.
Trinacria.....	Geo. Mitchell.			Lorenzo D. Baker.....	W. F. Wiley.
<i>Anglo-Australian S. S. Co.</i>		<i>New York and Cuba Mail S. S. Co.</i>		Am. Menzaleh.....	J. B. McKie.
Br. s. s. Port Phillip.....	Geo. Dulling.	Am. s. s. Cienfuegos.....	C. M. Faircloth.	Br. Picqua.....	William Clayton.
		<i>N. Y., Havana & Mexican Mail S. S. Co.</i>		Prydain.....	Moses Parry.
<i>Atlas Line.</i>		Am. s. s. City of Alexandria.....	J. W. Reynolds.	Span. Valencia.....	J. A. Estopiña.
Br. s. s. Atlas.....	David Williams.				
Span. Andes.....	A. de Ameyaga.	<i>North German Lloyd Steamship Co.</i>		<i>"New York Herald Weather Service."</i>	
Athos.....	Horatio Low.	Ger. s. s. America.....	G. Meyer.	Am. s. s. Acapulco.....	W. G. Shackford.
<i>Booth's S. S. Co. (limited).</i>		Donau.....	E. Ringk.	Br. Adriatic.....	H. Parrell.
Br. s. s. Clement.....	Thomas Burley.	Eider.....	H. Helmers.	Ailes.....	J. W. Sansom.
Cyril.....	J. H. Johnson.	Emis.....	W. Willigerod.	Albano.....	H. R. Hughes.
		Fulda.....	O. Heimbruch.	Alene.....	E. J. Seiders.
<i>Bristol-City Line.</i>		Hermann.....	H. Baur.	Alvo.....	D. Williams.
Br. s. s. Brooklyn City.....	W. Fitt.	Main.....	H. Christoffers.	Aurania.....	W. H. P. Hains.
Lieudart City.....	T. H. Gore.	Neckar.....	R. Busius.	Baltic.....	Robt. E. Benne.
		Salier.....	C. Wiegand.	Belgianland.....	W. A. Beynolds.
<i>Canada Shipping Co.</i>		<i>Occidental and Oriental Steamship Co.</i>		Br. Britannic.....	H. Perry.
Br. s. s. Lake Nepigon.....	M. L. Traumar.	Br. s. s. Arabic.....	W. G. Pearne.	Celtic.....	Benj. Glendell.
		Oceanic.....	John Metcalfe.	Chalmette.....	Robt. B. Quick.
<i>Canard Line.</i>		<i>Ocean Steamship Company.</i>		Br. City of Alexandria.....	J. W. Reynolds.
Br. s. s. Aurania.....	W. H. P. Hains.	Am. s. s. City of Augusta.....	K. S. Nickerson.	City of Berlin.....	Francis S. Land.
Bothnia.....	T. Roberts.			City of Chicago.....	Fred Watkins.
Catalonia.....	Alex. McKay.	<i>Oceanic Steamship Company.</i>		City of Chester.....	H. Condon.
Cephalonia.....	Henry Walker.	Am. s. s. Alameda.....	H. G. Morse.	City of Puebla.....	John Deakin.
Etruria.....	T. Cook.	<i>Oregon Railway and Navigation Co.</i>		City of Richmond.....	A. W. Lewis.
Gallia.....	M. Murphy.	Am. s. s. City of Chester.....	Thomas Wallace.	Colon.....	Chas. C. Lima.
Pavonia.....	B. Woolfenden.	Columbia.....	Fred Bolles.	Crescent City.....	Jas. L. Lockwood.
Scythia.....	P. Whelan.	Oregon.....	E. Polemann.	Eider.....	H. Helmers.
<i>Edward Carr's S. S. Line.</i>		<i>Pacific Mail Steamship Company.</i>		Elysia.....	James Brown.
Ger. s. s. Australia.....	G. Franck.	Br. Australia.....	R. C. Ghest.	Emis.....	Ch. Leist.
Europa.....	L. A. Kessal.	Am. City of Para.....	L. Dexter.	Gallia.....	M. Murphy.
India.....	I. I. von Holdt.	City of Peking.....	G. G. Berry.	Gelert.....	F. V. Schierbeck.
<i>Furness Line.</i>		City of Rio Janeiro.....	Wm. B. Cobb.	Ger. Ivanhoe.....	John Cameron.
Br. s. s. Ripon City.....	Ch. Off. Jas. Mansfield.	City of Sydney.....	H. C. Dearborn.	Lessing.....	B. Voss.
Stockholm City.....	Capt. K. Doyle.	City of Tokio.....	Com. Jefferson Maury.	Belg. Rhyndland.....	T. H. Bonjer.
		Colima.....	Capt. W. B. Seabury.	San Marcos.....	H. Weyer.
<i>General Trans-Atlantic Steamship Co.</i>		Granada.....	M. Connolly.	Saratoga.....	P. J. Irving.
Fr. s. s. Canada.....	G. de Kersabiec.	San Blas.....	Thos. Chapman.	Schiedam.....	J. C. Jamison.
St. Laurent.....	M. de Jousellin.	San José.....	A. D. Austin.	Servia.....	Ch. Off. A. B. Connor.
<i>Great Western S. S. Line.</i>		<i>Quebec Steamship Company.</i>		St. Laurent.....	Capt. John McIntosh.
Br. s. s. Dorset.....	Wm. Stamper.	Br. s. s. Muriel.....	G. S. Locke.	Switzerland.....	G. Bakker.
		Orinoco.....	Jas. S. Garvin.	W. A. Scholten.....	W. McMillan.
<i>Guion Line.</i>		<i>Red "D" Line.</i>		Waesland.....	M. de Jousellin.
Br. s. s. Wyoming.....	C. L. Rigby.	Am. s. s. Caracas.....	W. M. Hopkins.	Westernland.....	Geo. Moodie.
Wisconsin.....	Edward Bentley.	Philadelphia.....	Sam. Hess.	Wyoming.....	H. Buschmann.
		<i>Red Star Line.</i>		Zaandam.....	G. Bakker.
<i>Hamburg-American Line.</i>		Belg. s. s. Belgenland.....	W. A. Beynon.		J. Ueberweg.
Ger. s. s. Bohemia.....	R. Karlowa.	Nederland.....	Allen J. Griffin.	<i>Sailing vessels.</i>	
Friska.....	E. Kopff.	Pennland.....	Rud. Weyer.	Am. bg. Abbie Clifford.....	D. W. Storer.
Gallert.....	W. Kühlewein.	Rhyndland.....	J. C. Jamison.	bk. Alpha.....	W. W. Gheen.
Hammonia.....	H. F. Schwensen.	Switzerland.....	H. Buschmann.	Am. bk. Arcot.....	O. C. Grün.
Lessing.....	B. Voss.	Waesland.....	J. Ueberweg.	bk. Argos.....	J. W. Cates.
Moravia.....	O. Perzoldt.	Westernland.....	Com. W. G. Randle.	bk. Angela Schaffno.....	Enrico Schaffno.
Rhaetia.....	Reuter.			Am. Antonia Sala.....	F. H. Mitchell.
Rugia.....	A. Albers.	<i>Rotterdam Line.</i>		Ger. sp. Baltimore.....	N. Freese.
Suevia.....	C. Ludwig.	Dutch. s. s. Edam.....	Capt. J. H. Taat.	Am. bg. Belle of the Bay.....	E. W. Welton.
Wieland.....	C. Heibich.	Leerdam.....	P. Slierendregt.	Ger. bk. Betty.....	S. Wohlmut.
Westphalia.....	H. Barends.	P. Caland.....	T. H. Bonjer.	Br. sp. Casares.....	J. C. Barrette.
		W. A. Scholten.....	G. J. Vis.	Am. bkt. C. S. Bushnell.....	J. F. Mayo.
<i>Imman Line.</i>		Zaandam.....	A. Potjer.	Br. Corsica.....	Daniel Thoms.
Br. s. s. City of Berlin.....	Francis S. Land.	<i>State Line.</i>		Ger. bk. Cornelius.....	H. Windhorst.
City of Chicago.....	Fred Watkins.	Br. s. s. State of Georgia.....	G. Moodie.	Br. sp. E. J. Spicer.....	L. Haedloep.
City of Richmond.....	A. W. Lewis.	State of Nevada.....	John A. Stewart.	Am. bk. Exile.....	Lewis Spicer.
<i>Johann Line.</i>		<i>Thingalla Line.</i>		Am. bk. Florence Rogers.....	Smith D. Mason.
Br. s. s. Nassmore.....	John Inch.	Dan. s. s. Geiser.....	F. V. Schierbeck.	Dan. bk. Galeon.....	Geo. J. Pearce.
		Hekla.....	A. G. Thomsen.	Am. bk. Georgia.....	J. S. F. McLeod.
<i>Lamport & Holt's Steamship Company.</i>		Island.....	W. Skjold.	Am. bk. George Washington.....	H. G. Kalsboll.
Br. s. s. Basel.....	Chas. J. Watson.	Thingalla.....	S. T. H. Laub.	Ger. bk. Governor Hall.....	E. G. Coffin.
Biela.....	Fred Graham.	<i>U. S. and Brazil Mail S. S. Co.</i>		Am. bk. Grundloven.....	J. Probst, jr.
Hevelius.....	John Carroll.	Am. s. s. Advance.....	Jas. R. Beers.	Ger. bk. Heinrich & Tonio.....	John Cain, jr.
Hipparchus.....	Wm. Kelly.	Finance.....	Ch. Off. James Lord.	Am. sp. Henry Villard.....	O. G. Ellingen.
Belg. Dalton.....	J. Russell.	<i>Warren Line.</i>		Br. bk. Idaho.....	L. Myer.
Br. Donati.....	John P. Bevin.	Br. s. s. Iowa.....	Capt. Samuel Walters.	Ger. bk. Iodine.....	F. B. Perkins.
Eucled.....	Alex. W. Pym.	<i>White Cross Line.</i>		Am. bk. Jacob.....	W. S. Richardson.
Sirius.....	W. H. Stapledon.	Dutch. s. s. De Ruyter.....	J. J. Brarens.	Ger. bk. James H. Gordon.....	Adam Smith.
		Belg. Jan Breydel.....	H. Meyer.	Am. bk. John J. Marsh.....	Adolph Linder.
<i>Legland Line.</i>		<i>White Star Line.</i>		Am. bk. John Wesley.....	W. Lawrence.
Br. s. s. Venetian.....	W. H. Trant.	Br. s. s. Adriatic.....	H. Parsell.	bkt. Levantar.....	James Tooker.
Virgilian.....	M. Fitt.	Baltic.....	R. E. Benne.	Am. bk. Lillian.....	F. P. Whittier.
<i>Liverpool, Brazil and River Plate Steam Navigation Company.</i>		Britannic.....	H. Perry.	Br. bk. Mistletoe.....	John H. Hines.
Br. s. s. Others.....	James Clarke.	Celtic.....	Benj. Glendell.	Am. bk. Sarah D. J. Rawson.....	A. S. Vesper.
		Germanic.....	C. W. Kennedy.	Ger. bk. Stella.....	A. Alexander.
<i>Mallory Line.</i>		Republic.....	P. J. Irving.	Am. bk. Stephen Bennett.....	H. F. Schive.
Am. s. s. Alamo.....	Sam. Risk.			It. bk. Vincenzo Accame.....	Israel Delap.
Lampusae.....	M. B. Crowell.				Thos. P. French.
San Marcos.....	A. C. Burrows.				Alex. Wilson.
<i>Mediterranean and New York S. S. Co.</i>					W. W. Frost.
It. s. s. Archimede.....	Domenico Viola.				G. H. E. Horn.
Gottardo.....	G. Diliberto.				William Douglas.
					Alfred Biddle.
					N. V. Lavagna.

To preserve a record of the special twilight phenomena known as "red sunsets," and in order to recognize the normal features of ordinary sunsets and twilight colors, observers are requested to make, as often as practicable, a record, by descriptions and sketches, of the character of sunsets and sunrises.

In these observations the special phenomena to be noted are:

1. Time (hour and minute) of sunset or sunrise.

2. The names of the tints, their combinations and shades (pale, light, dark, deep, &c.), as suggested by the following list:

Black—brown, russet;
White—gray, drab, slate;
Violet—purple, lavender;
Blue;
Green—olive;
Yellow—saffron, salmon, lemon;
Orange;
Red—rose, pink.

3. The location (altitude and azimuth) of the colors and their time of appearance, of maximum intensity, and of final disappearance; noting especially any secondary increase of brightness.

4. The visibility of the twilight arch—an ashy gray arch dividing the region of perfect darkness from that of twilight, and which begins to rise in the east after sunset; note specially the time when it passes westward over the zenith.

Observers are also requested to record daily the visibility, extent, and tints of the so-called "Bishop's Ring," which is an area of white or pink and purple haze surrounding the sun, with a rather definite boundary, at a distance from it of from ten to twenty degrees; this is visible during the morning and, especially, the afternoon in clear and fair weather.

MONTHLY WEATHER REVIEW.

VOL. XIII.

WASHINGTON CITY, JULY, 1885.

No. 7.

INTRODUCTION.

This REVIEW contains a general summary of the meteorological conditions which prevailed over the United States and Canada during July, 1885, based upon the reports from the regular and voluntary observers of the Signal Service and from co-operating state weather services.

Descriptions of the storms which occurred over the north Atlantic ocean during the month are also given, and their approximate paths shown on chart i.

July, 1885, like the preceding month, has not been marked by any abnormal meteorological features.

On chart i. are traced the paths of nine atmospheric depressions; these, with four minor depressions (not charted), are described under "Areas of low barometer." The average number of depressions charted for July during the last twelve years corresponds with the number for July of the current year.

The most violent and destructive local storms of the month occurred in Minnesota, Wisconsin and Michigan, on the 8th, during the prevalence of low area iii.

The mean temperature in all districts corresponds very nearly with the July normal.

Marked deficiencies in the monthly precipitation occurred on the Atlantic coast and in the Ohio valley; in the district last named and in New England the average precipitation was about one-half the normal amount. In other districts the average precipitation, as compared with the normal, shows no decided excess or deficiency, although at certain stations the departures, both above and below the normal, were quite marked.

Over the north Atlantic ocean the weather was generally pleasant, the month being free from violent storms.

The area of the region covered by icebergs in the north Atlantic is less than in the preceding month; these dangers to navigation now seem to be disappearing.

In the preparation of this REVIEW the following data, received up to August 20th, 1885, have been used, viz.: the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and twenty-nine Signal Service stations and twenty-one Canadian stations, as telegraphed to this office; one hundred and fifty-six monthly journals and one hundred and sixty-two monthly means from the former, and twenty-one monthly means from the latter; two hundred and eighty-seven monthly registers from voluntary observers; reports from 1,421 special tornado observers; forty-six monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs, furnished by the publishers of "The New York Maritime Register;" monthly weather reports from the local weather services of

Alabama, Ohio, Indiana, Missouri and Nebraska, and of the Central Pacific Railway Company; trustworthy newspaper extracts, and special reports.

ATMOSPHERIC PRESSURE.

[Expressed in inches and hundredths.]

The distribution of mean atmospheric pressure for July, 1885, determined from the tri-daily telegraphic observations of the Signal Service, is shown by the isobarometric lines on chart ii.

The mean pressure is least over the central and southern Rocky mountain regions, where the monthly barometric means range from 29.75 to 29.85, the lowest being reported from Fort Thomas, Arizona; it is greatest in the south Atlantic and Gulf states, and on the north Pacific coast, where the means range from 30.00 to 30.04, the highest occurring at Key West and Sanford, Florida, and Fort Canby and Tatoosh Island, Washington Territory.

As compared with the mean pressure for the preceding month, an increase is shown over the southern plateau, the eastern Rocky mountain slope, west Gulf states, southern Florida, northern New England, and the Maritime Provinces. Except over the Maritime Provinces and a part of the southern slope, where the increase varies from .05 to .07, the barometric means in the districts before-named range from .01 to .05 higher than those for June. In all other districts the pressure is lower than that for the preceding month, the deficiency exceeding .05 on the northern California coast, over the region to the north of the Ohio and Missouri rivers, and in the southern part of the middle Atlantic states.

The departures from the normal pressure at the various stations are given in the table of miscellaneous meteorological data; they are also shown on chart iv. by lines connecting stations of equal departure. It will be seen from the chart named that there are no marked departures from the normal. On the Atlantic coast, over portions of the northern slope and lake region, and in the southern districts from the Mississippi river to the Pacific coast, the pressure is slightly above the normal, the departures being generally less than .05. In the remaining districts slight deficiencies are shown, the maximum departures occurring over the extreme northwest and the north Pacific coast region, where they vary from .05 to .07.

MONTHLY BAROMETRIC RANGES.

The monthly ranges were greatest in the extreme northwest, Saint Vincent and Moorhead, Minnesota, reporting the maximum, .82; they were least in southern Florida and over the southwestern part of the country from the west Gulf states to the Pacific coast. The smallest monthly ranges are as follows: .16, at Fort Davis, Texas; .20, at Fort Grant, Arizona, and Fort Stockton, Texas; .23, at Key West, Florida. The monthly barometric ranges at the various Signal Service stations are given in the table of miscellaneous meteorological data.

AREAS OF HIGH BAROMETER.

I.—The feeble anti-cyclonic area over the upper Mississippi, Missouri, and Ohio valleys dominated the weather conditions during the 1st. During the 2d this area became central near Cairo, but moved to the south and east. During the 3d it pushed to the south Atlantic and east Gulf states, where it continued to rest during the 4th, with occasional rains in the Southern states on this date. The isobar of 30.00 inclosed this

area since its appearance. During the 4th a part of this area appeared to become detached and rest over the north Atlantic coast, where it continued as a decided high area till the 8th. The high area in the south Atlantic and east Gulf states continued, but without any energy, till the 6th, when the crowding down of the low increased the pressure, and from this date till the 9th it prevailed in the southern districts. The phenomena described as low area number xiii. is interesting as having occurred in the west margin.

II.—This area continued over the north Pacific coast from the 2d till the 5th, when it disappeared; its general characteristic was an absence of rainfall over that region.

III.—This area appeared on the 8th in Montana, following the storm-centre before it. By midnight of the 9th it had advanced as far as Minnesota. During the 10th it was prevalent from the Missouri river to Lake Huron, but more feeble; the departure from the normal was only slight. This high was accompanied by a cool wave from the Missouri valley to the middle Atlantic coast. During the 11th it had moved eastward to New York, and its centre during the 12th was over the Atlantic coast, its western margin not disappearing till after the 13th.

IV.—During the 13th the pressure rose on the north Pacific coast, remaining stationary till the 16th, when the area became central over the Columbia valley, within the isobar of 30.1, but soon disappeared.

V.—An anti-cyclonic area with no gradients was present on the Atlantic coast the 16th, and was intensified by the passage of the low to the north and at the same time pushed into the Southern states. During the 17th, in the rear of the advancing low, the pressure rose in the upper Mississippi valley and upper lake region, which, during the 18th, coalesced with that in the Southern states and a high area prevailed from Canada to the Gulf, but was most decided in the lake region. During the 19th it was scarcely perceptible, having spread out over all districts east of the Mississippi river. It was under the influence of this area that some of the excessively warm days occurred on the Atlantic seaboard.

VI.—This area became apparent on the north Pacific coast on the 18th and continued with constant conditions till the 24th. The characteristics of clear weather were continued, as in like areas before-mentioned.

VII.—During the 20th this area appeared, with slight energy, in the northwest, following a low area. During the 21st it became more feeble and during the 22d spread from the Saint Lawrence valley to the Gulf of Mexico, so continuing during the 23d, passing off Nova Scotia on the 24th, the southern portion continuing over the Southern states during the 25th.

VIII.—This area followed a depression in its advance, but was of only slight energy. During the 25th it was north of the lake region. During the 26th it dropped down to New England, and with the depression over Chesapeake bay came the relief from the great heat that had prevailed for eleven days. During the 27th this area moved off Nova Scotia.

IX.—This appeared in Manitoba on the 30th, not advancing further than Minnesota by the end of the month.

AREAS OF LOW BAROMETER.

During the month eleven areas of low pressure or cyclonic disturbances passed within the field of observation made by the reports. Nine of these are charted, from i. to ix., inclusive. Numbers x., xi., xii., and xiii. were feeble depressions and need but mention in the study as accounting for heavy rain occurrences and high temperatures. Number i. is a continuation of number vii. for June.

In this REVIEW is given the lowest barometer reading found within the area of depression, also the amount of greatest departure found within the isobar inclosing the area. Numbers iii. and vii. developed considerable energy for summer cyclonic areas, and are represented on chart i., by heavy lines showing portions of paths of greatest severity.

The abnormal paths taken by numbers i. and ii. are remarkable for their westerly movement. The close succession of one area after another during the first part of the month, with the absence of any decided depression during the latter portion, is worthy of note. The location of all paths to the northern portion of the United States and in Canada, except small local developments of cyclonic character as far south as Tennessee, characterize July, 1885. The average progress of storm-tracks is in excess of the mean as determined for several years, which is 24.6 miles per hour.

The following table gives the latitude and longitude in which each area was first and last observed, and the average hourly velocity for the three periods between the observations and also during the storm:

Areas of low barometer.	First observed.		Last observed.		Average velocity in miles per hour			
	Lat. N.	Long. W.	Lat. N.	Long. W.	11 p. m. to 7 a. m.	7 a. m. to 3 p. m.	3 p. m. to 11 p. m.	During storm.
No. I.....	43 00	69 00	47 30	70 00	14.4	13.7	22.5	17.4
II.....	42 00	105 00	51 00	95 00	14.2	19.6	20.3	18.2
III.....	46 30	112 00	45 00	67 00	49.6	30.6	40.6	40.2
IV.....	51 30	110 00	48 30	68 00	23.3	19.1	31.9	24.7
V.....	38 00	75 00	39 30	72 30	.....	16.2	.....	16.2
VI.....	51 30	105 00	43 00	88 00	31.9	30.0	27.5	29.9
VII.....	46 00	112 00	48 30	68 00	27.1	33.7	30.3	30.4
VIII.....	44 30	100 00	44 30	63 00	17.5	31.6	32.5	27.8
IX.....	43 00	100 30	47 00	85 00	28.7	10.0	58.7	39.5
Mean hourly velocity.....					25.0	24.0	30.1	26.4

I.—On the morning of July 1st a depression rested over the coast of New England; in the afternoon the centre of depression was located east of the White mountains, where heavy rains occurred, raising the rivers in central Maine. The pressure was gradually increasing to eastward and was falling to the westward over the lake region. At the same time rains were reported in the provinces to the northeastward, but none west of New England, as appeared from the Signal Service telegraphic reports. At midnight the pressure continued falling to the westward, and on the 2d rains fell over Lake Erie and the middle Atlantic states. From this time till the disappearance of the depression no decided barometric changes occurred, while the rainfall was gradually diminishing. The abnormal westward movement may be accounted for by the barometer falling to westward, its rising to eastward, and the feeble influences existing to create any decided movement, and instead of there being a distinct progressive storm-centre this might be said to be a large and nearly stationary depression resting over this region, indicated by the storm track. During the 1st and 2d brisk and occasionally high westerly winds occurred from Maine to the Virginia capes, and southerly winds at Eastport, where a number of vessels were delayed.

The following shows the lowest barometer readings and greatest departure from the normal:

July 1st, 7 a. m., 29.60, departure, —.31; 3 p. m., 29.61, departure, —.25; 11 p. m., 29.63, departure, —.26. July 2d, 7 a. m., 29.67, departure, —.24; 3 p. m., 29.68, departure, —.15; 11 p. m., 29.80, departure, —.14. July 3d, 7 a. m., 29.78, departure, —.13; 3 p. m., 29.78, departure, —.07; 11 p. m., 29.84, departure, —.06.

II.—A considerable depression overlay the upper Mississippi and Missouri river valleys and westward to the Rocky mountains prior to this development, but in the afternoon of the 4th a decided fall was observed near its western edge at Cheyenne, Wyoming, and thence to Huron, Dakota. During the first eight hours the greatest fall of the barometer took place in northern Dakota, thus moving the centre of depression forward to near Huron. The barometer continued falling from Manitoba to Missouri, and the depression covered a large area, which was central near Moorhead, Minnesota, early on the 5th. During this date the pressure fell in Michigan and Manitoba, rising between these sections. The depression moved to Lake Superior and afterward receded northwesterly. During the

6th heavy rains and dangerous winds occurred on the western lakes, with frequent thunder-storms. The low area during the 6th and 7th central in Manitoba remained nearly stationary, with steep gradients and heavy rains to the southeast.

July 4th, 3 p. m., 29.70, departure, —.11; 11 p. m., 29.69, departure, —.21. 5th, 7 a. m., 29.63, departure, —.29; 3 p. m., 29.55, departure, —.36; 11 p. m., 29.59, departure, —.36. 6th, 7 a. m., 29.49, departure, —.44; 3 p. m., 29.27, departure, —.49; 11 p. m., 29.24, departure, —.59. 7th, 7 a. m., 29.21, departure, —.62; 3 p. m., 29.41, departure, —.47.

III.—This area should be closely studied in connection with the preceding one which, while resting north of Minnesota and Dakota, pushed southward from it in a tongue-shaped area late on the 7th. On the 8th was formed into an area with distinctly separate depressions in Colorado, in southern Minnesota, and in Manitoba, the latter being the general depression, number ii., which continued in this region. Heavy rains and high winds prevailed in the disturbed sections during the night of the 8th, when it passed beyond the boundary of the United States. This area assumed the long oval shape which always are accompanied by severe winds, move rapidly, and are generally the most severe character of storm developments which occur in the lake regions. This cyclonic disturbance is charted as most severe during the night of the 8th and after. It was within its influence that severe thunder-storms, hurricanes, hail storms, and tornadoes occurred north of the fortieth parallel and east of the Missouri river. At La Crosse heavy rain, with thunder, fell from 7.30 to 9.20 p. m. and hail for ten minutes, ending at 8.25; for five minutes the wind blew at the rate of 48 miles per hour. This storm came from the north and did considerable damage to crops. Milwaukee, a thunder-storm occurred during the night of the 8th and 9th, passing from nw. to se. A large elevator was damaged by lightning. Reports from Tomah and Sparta and vicinity, in the interior, state that the storm was very severe. Grand Haven, a thunder-storm prevailed during the night of the 8-9th, the wind reaching a velocity of 36 miles per hour from sw. The life-saving crew report the storm as exceedingly severe for the season. At Rochester a gale prevailed from 9.05 a. m. till 4.30 p. m. the 9th, being sw., 32 miles, at 10.40 a. m. The following shows stations and time of severe winds on the great lakes: Duluth, 12 midnight, 8th, for two hours; Escanaba, 9 p. m., 8th, till 10.30 p. m.; Milwaukee, 12 midnight, 8th, ending 11.45 a. m.; Chicago, 1 p. m., 8th, till 12.30 a. m. 9th; Grand Haven, 2.45 a. m. till 4.30 a. m., 9th; Alpena, 12.30 a. m. till 2 p. m., 9th; Port Huron, 11.45 a. m. to 4.30 p. m., 9th; Detroit, from midnight till 2 p. m. and fresh till 6 p. m., 9th; Sandusky, 10 p. m., 7th, till 7.30 a. m., 9th; Cleveland, 9 a. m., 8th, till 10 a. m., 9th; Erie, midnight, 9th, till 4.30 p. m.; Buffalo, 6 a. m., 8th, till 10 p. m., 9th, highest during the afternoon of the 9th; Oswego, 6.30 a. m., 9th, till 2.45 p. m. The following occurrences of tornadoes or severe local storms are recorded: tornado west of Saint Paul, 3.25 p. m., 8th; southwest, at 6.30 p. m.; southeast, at 5 p. m. In Wisconsin the tornadoes occurred between 6 and 8 p. m. of the 8th, and in Michigan, southeast of Grand Haven, at midnight. The next afternoon the tornado occurred in Massachusetts at 4.35 p. m., in Maine at 3 p. m.; and the gales of hurricane violence throughout New England, eastern New York, New Jersey, and eastern Pennsylvania, occurred in the evening from 3 to 10 p. m. Prior to the advent of this storm very oppressive temperatures, much above the normal, had prevailed from New England to the west, causing several cases of sunstroke in New York. After reaching the Gulf of Saint Lawrence the area moved southwest over Maine and then again eastward, but with no severity.

The following shows the lowest barometer and greatest departure for this storm at each report:

July 7th, 11 p. m., 29.69, departure, —.22. 8th, 7 a. m., 29.57, departure, —.35; 3 p. m., 29.68, departure, —.26; 11 p. m., 29.65, departure, —.27. 9th, 7 a. m., 29.65, departure, —.23; 3 p. m., 29.53, departure, —.32; 11 p. m., 29.53, departure,

—32. 10th, 7 a. m., 29.60, departure, —.30; 3 p. m., 29.55, departure, —.32.

IV.—This appeared on the 11th as a depression in the Saskatchewan valley, which spread out and moved central over Manitoba by midnight, causing heavy rains in northern Dakota. During the 10th the movement was rapidly to the southeastward to Lake Superior, attended with gales and heavy rains in its advance. During the 13th the area, as represented by the isobars, appeared as a tongue reaching down to the south Atlantic coast, but central near Lake Erie. Very heavy rains fell from Florida to Canada under its influence, and exceedingly heavy rains in Pennsylvania, flooding many streams. A hail storm occurred at Indianapolis, p. m., 13th. The extreme southern portion of this tongue might be described as a subsidiary depression, developing over Tennessee, which was soon merged into the more general one to the north. The sudden movement to the south, shown on the chart during the 13th, is to be attributed to the uniting of these depression areas. Closely related to this, another distinct depression on the following day, described as number v., and which appears likewise to have coalesced with the more general one, passing slowly down the Saint Lawrence valley till it disappeared.

The following shows the lowest barometer and departure from the normal for this storm within its lowest isobar:

July 12th, 7 a. m., 29.60, departure, —.31; 3 p. m., 29.57, departure, —.29; 11 p. m., 29.65, departure, —.28. 13th, 7 a. m., 29.66, departure, —.27; 3 p. m., 29.67, departure, —.22; 11 p. m., 29.63, departure, —.25. 14th, 7 a. m., 29.65, departure, —.28; 3 p. m., 29.64, departure, —.24; 11 p. m., 29.66, departure, —.25. 15th, 7 a. m., 29.64, departure, —.20.

V.—This area, as in description of the previous low, might be called subsidiary to it, or as a breaking away of the southern end of the tongue that, on the midnight of the 13th, extended from Canada to Georgia. It became, on the morning of the 14th, a distinct depression over Chesapeake bay and accompanied by very heavy rains on the Atlantic coast within its influence. By midnight of the 14th it merged into the greater depression to the north. The weather now cleared and a drought followed, with exceedingly high temperatures in the Atlantic states till the end of the month. The barometer and departures were as follows: July 14th, 7 a. m., 29.67, departure, —.30; 3 p. m., 29.65, departure, —.28.

VI.—This depression followed quickly behind number iv., advancing rapidly from the Saskatchewan valley to Lake Michigan during the 13th and 14th, and during the night of the latter merged into low number iv., or was lost in the general depression which prevailed over the entire northern sections of the country. It was accompanied by no decided rains or gales. The lowest barometer and greatest departure from the normal is shown by the following: July 13th, 3 p. m., 29.63; 11 p. m., 29.67, departure, —.23. 14th, 7 a. m., 29.68, departure, —.30; 3 p. m., 29.65, departure, —.26; 11 p. m., 29.72, departure, —.23.

VII.—This cyclonic area developed in Montana on the afternoon of the 14th, and by midnight had assumed the shape of a long oval from Fort Buford, Dakota, to Salt Lake City, Utah. During the 15th it developed into a decided cyclonic area central over Dakota, with heavy rains and severe gales in its front and a tornado in southern Dakota. During the 16th it continued in severity, advancing across Minnesota, and at midnight was central over northern Lake Michigan. Threatening weather, with gales and thunder-storms, occurred on its south and east sides. Its severity rapidly diminished on the 17th, and with a rapid movement from the early morning of this date it disappeared in the Gulf of Saint Lawrence. During this rapid movement only occasional gales occurred in the lower lakes, but with a dangerous, brisk, southwesterly wind. During the passage of this storm from the evening of the 15th to the 17th the chart indicates its severity. A tornado occurred west of Huron, Dakota, between 6 and 7 p. m., the 15th. At Fort Maginnis, Montana, a northerly and northwesterly gale blew during the 15th and 16th. Fort Totten, Dakota, 15th, a very

destructive hail storm, about four miles wide, occurred about 11 p. m., between Niagara and Reynolds. It is estimated that \$200,000 worth of wheat was destroyed. Fort Buford, Dakota, 15th, an easterly gale began at 3.45 p. m., continuing till 8.25 next morning. The wind veered to northwest and on the 16th blew at the rate of forty-nine miles. A thunder-storm occurred at 7.30 p. m., moving from the west, it was accompanied by a very heavy fall of hail, lasting about thirty seconds. Moorhead, Minnesota, 15th, a thunder-storm prevailed, with rain at intervals, during the evening. At 8.58 p. m., heavy hail fell, lasting eight minutes, the hail-stones being from one-half to one inch in diameter and in sufficient quantity to cover the ground to the depth of two inches or more. Reports show that but little hail fell, except in vicinity of Moorhead, Minnesota, and Fargo, Dakota. The damage to gardens was great.

The following shows the commencement and ending of strong winds, with direction and highest velocity during the storm for all the lake stations, viz:

Duluth, 16th, 3 p. m. till 11 p. m., sw., 28 miles; Marquette, 16th, 3 a. m. till 2 p. m. 17th, s., 30 miles; Escanaba, 16th, 6 a. m. till 2 p. m. 17th, s., 24 miles; Milwaukee, 16th, 8.30 a. m. till 6 a. m. 17th, s., 35 miles; Chicago, 16th, 1 p. m. till 1 a. m. 17th, s., 22 miles; Grand Haven, 16th, 8 a. m. till 8 p. m. 17th, s., 36 miles; Mackinaw City, 16th, 10 a. m. till 3 p. m. 17th, sw., 32 miles; Alpena, 16th, 8 a. m. till 10 p. m. 17th, sw., 28 miles; Port Huron, 16th, 9 a. m. till 10 p. m. 17th, se., 22 miles; Detroit, 16th, 11 a. m. till 7 p. m. 17th, s., 25 miles; Toledo, 16th, 12 m. till 8 p. m. 17th, se., 21 miles; Sandusky, 16th, 12 m. till 3 p. m. 18th, sw., 20 miles, and nw., 24 miles; Cleveland, 16th, 2 p. m. till 6 p. m. 17th, sw., 22 miles; Erie, 16th, 9 p. m. till 9 p. m. 17th, sw., 16 miles, and w., 20 miles; Buffalo, 16th, 10 p. m. till 10 p. m. 17th, sw., 29 miles; Oswego, 16th, 10 p. m. till 10 p. m. 17th, sw., 16 miles.

This cyclonic area diminished after passing over the lakes and did not impinge upon the high over the Atlantic states, and only served to increase the southerly winds which heated more and more the middle Atlantic coast districts. The highest temperature ever recorded at Albany, New York, occurred on the 17th, being 96°.6; also at New York City much suffering occurred this date. At Block Island, Rhode Island, also, the highest temperature, 87°.8, ever recorded by the Signal Service occurred the 18th. This storm was unlike that of the 8th, being opposed by a strong barrier in the form of a high on the middle Atlantic coast. No local storms of note occurred on its southeastern margin and the effect of increasing the south and southwest winds brought on the most excessively hot weather. The storm of the 8th had a high in the Southern states, and with local depression formations in its southern portion, which were entirely absent in this low area.

The route of its feeble influence after the 17th was down the Saint Lawrence valley. The following gives the intensity of the depression:

July 14th, 3 p. m., 29.70, departure, —.18; 11 p. m., 29.59, departure, —.30. 15th, 7 a. m., 29.54, departure, —.40; 3 p. m., 29.47, departure, —.49; 11 p. m., 29.40, departure, —.57. 16th, 7 a. m., 29.35, departure, —.57; 3 p. m., 29.44, departure, —.50; 11 p. m., 29.56, departure, —.36. 17th, 7 a. m., 29.81, departure, —.11; 3 p. m., 29.66, departure, —.19; 11 p. m., 29.58.

VIII.—A depression had overlaid the Rocky mountain region for some days, and on the afternoon of the 18th began developing in a slight depression in Dakota. During the night a rapid fall to the westward retarded its further movement, but a tongue projected from the main depression eastward towards the lakes and soon formed into a long oval-shaped low area extending from Manitoba to northern Texas, but with the lowest departure in southern Dakota. High winds, thunder-storms, and rains already fell in the upper lake region in its advance during the afternoon of the 19th. During the 20th the movement was rapid towards lake Huron, but attended by no strong gales; heavy rain was abundant. During the

20th the depression moved over New England, causing a few high winds on the coast north of the Delaware capes, and a hurricane with heavy rain in northern Pennsylvania. At Milwaukee, and vicinity, on the 19th, a severe storm occurred, with heavy rain and thunder; the highest wind-velocity was thirty-six miles per hour. At Chicago, on the 19th, an unusual fluctuation of temperature occurred, as follows: 11 a. m., 86°; 11.40 a. m., 67°; 12 m., 70°; 7 p. m., 92°. At New London, on the 21st, a thunder-storm was accompanied by an electric display such as is seldom witnessed; it began at 5.50 p. m. and continued for nearly an hour, many buildings were struck, and many persons experienced dangerous shocks.

The following shows the lowest barometer and greatest departure within the area of depression: July 18th, 3 p. m., 29.79, departure, —.11; 11 p. m., 29.83, departure, —.11. 19th, 7 a. m., 29.74, departure, —.19; 3 p. m., 29.62, departure, —.28; 11 p. m., 29.68, departure, —.22. 20th, 7 a. m., 29.73, departure, —.15; 3 p. m., 29.76, departure, —.13; 11 p. m., 29.80, departure, —.13. 21st, 7 a. m., 29.74, departure, —.20; 3 p. m., 29.68, departure, —.20; 11 p. m., 29.73, departure, —.20.

IX.—This was a very slight depression, but was attended by remarkably heavy rains in Nebraska, and especially at Omaha, being 2.57 inches. The movement of this depression was at first slow but during the night of the 23d it passed into Canada, with light local rains. It has been observed, during this, that when a depression hovers for some time in one locality that unusually heavy rains generally result.

The lowest barometer and greatest departures were as follows:

July 23d, 7 a. m., 29.75, departure, —.15; 3 p. m., 29.79, departure, —.10; 11 p. m., 29.83, departure, —.11. 24th, 7 a. m., 29.82, departure, —.07.

X. [not charted].—During the night of the 25th very heavy rainfalls occurred in the Missouri valley, which may be attributed to a projecting tongue reaching from a low over the Rocky mountain districts. Disturbed conditions were present from Nebraska eastward during the 25th and 26th, but without any depression of the barometer below the normal. A tornado occurred in northern Kansas, and hail, with heavy rain and wind, in southern Minnesota. Also a hurricane and heavy rain in southern Ohio on the 26th, during the afternoon.

Denver, Colorado, 26th, during the afternoon (at 1.47 and at intervals till 8.55), a thunder-storm generated; it was not severe at Denver, but at a place known as the "Divide," about forty miles south, a "cloud-burst" occurred which caused a destructive freshet in Cherry creek, which runs through Denver. As late as 5.30 p. m. it was entirely dry, as is usual at this season, at 6 p. m. the creek was so swollen as to overflow. The current was very rapid, resulting in great destruction to property; bridges and a number of houses were swept away. This freshet was the most destructive that has occurred since 1878.

At Pike's Peak and Colorado Springs a most terrific electric storm prevailed during the night of the 26th, with a water-spout or "cloud-burst" at Colorado Springs, which washed away some houses and drowned persons. Professor Strieby describes it very fully, an extract of which appears under "Floods." Omaha, Nebraska, 25th, a very severe thunder-storm occurred between 1.43 and 2.10 a. m., passing from se. to nw. Extraordinary rainfall, amounting to 2.74 inches, did considerable damage. Huron, Dakota, 26th, heavy hail fell thirteen miles north, causing damage to crops. Thunder-storms occurred during the 25th and 26th at all stations from the Rocky mountains to the Missouri river.

XI. [not charted].—This disturbance resulted from fluctuating conditions over east Tennessee, the Carolinas, and in the neighborhood of the middle Atlantic coast during the 26th and 27th. Occasional heavy rains and thunder-storms occurred. Steep gradients from a high in southern New England and the depression over Chesapeake bay caused gales on the coast of New Jersey and near Long Island. During this disturbance the barometer at no station within its influence was below the normal.

Baltimore, 26th, a thunder-storm, with heavy rain at intervals, prevailed from 3.10 to 8.15 p. m. Buildings were struck by lightning and considerable damage done by the flood. At the same time at New York the crops were suffering from a severe and protracted drought. At Washington City only light thunder showers occurred.

XII. [not charted].—During the night of the 28th the pressure was below the normal in all districts east of the Rocky mountains, but the greatest depression below the normal was observed in the northwest and from the Saint Lawrence valley to Georgia; these conditions continued on the 29th, with the depression never apparent on the Atlantic coast. In the northern portion of the upper Mississippi valley very heavy rain fell during the 29th, with winds reaching a hurricane violence in the vicinity of Dubuque, Iowa, Saint Paul and Moorhead, Minnesota, Fort Totten, Dakota, and many destructive hail storms occurred. During the 30th the depression was most decided near the Atlantic coast, with resulting brisk winds. It was during this period of undecided conditions that extreme heat prevailed over the entire country east of the Rocky mountains, being, however, most intense in the upper Mississippi and Missouri valleys, the extreme northwest and the northern plateau region.

XIII. [not charted].—On the 1st, on the west margin of high number 1, a depression overlay the Rocky mountain region; an extension of this depression to the eastward caused steep gradients in Kansas. It appeared to extend eastward in a tongue shape over Kansas and the Indian Territory, which conditions continued, and on the 3d a local depression formed over the Ozark mountains in Arkansas and southern Missouri. The following remarkable rainfalls may be attributed to this phenomenon: Lamar, Missouri, severe southeast rain-storm began on evening of the 1st, continuing till noon of 2d, amount, 1.83. Heavy southeast thunder-storm began about 6 p. m. of 2d, continuing till after midnight. From 6.40 p. m., 3d, till 4 a. m., 4th, 4.44 inches of rain fell. The total of 6.27 inches fell in thirty-three consecutive hours, causing washouts on railroads and carrying away bridges. A train and bridge were washed away with the loss of three lives. Thunder-storms with rain also occurred on the 4th after heavy rain, and also on the 5th.

Fort Concho, Texas, 5th, a sand storm and hail and heavy rain storm occurred. Thunder-storms were frequent in the middle slope and west Gulf states during the period of this disturbance. Heavy rain also fell at time of severe storm in southeastern Kansas, and all rivers were flooded, which affected the Arkansas at Fort Smith the 5th, and rose till the 7th, when highest. At Little Rock the river began rising the 7th, rising rapidly on the 8th, continuing till the p. m. of the 10th.

NORTH ATLANTIC STORMS DURING JULY, 1885.

[Pressure expressed in inches and in millimetres; wind-force by scale of 0-10.]

The paths of the depressions that have appeared over the north Atlantic ocean during the month have been determined, approximately, from international simultaneous observations furnished by captains of ocean steamships and sailing vessels; abstracts of ships' logs and other data collected by the Signal Service agencies at the ports of New York, Boston, and Philadelphia; reports furnished through the co-operation of the "New York Herald Weather Service," ships' logs furnished by the proprietors of the "New York Maritime Register," and from other miscellaneous data received at this office up to August 21, 1885.

Of the six depressions traced over the ocean, two, viz., numbers 3 and 4, were apparently continuations of disturbances which had previously traversed the north American continent, but neither of these appears to have reached the European coasts. The depressions charted were mostly unimportant and of slight intensity, the greatest force of wind rarely exceeding that of a fresh gale.

During the first five days of the month the atmospheric pressure over the ocean remained generally high, ranging from

about 29.9 (759.4), on the Banks of Newfoundland, to 30.3 (769.6), between the meridians of 40° and 20° W. On the 6th a decrease of pressure set in over the region north of 50° N., and between 40° W. and the British coast, and continued, causing moderate gales and unsettled weather until the 10th. On the 8th a disturbance, number 2, apparently developed near 40° N., 48° W., and this, during its passage eastward on the following days, caused a general diminution of the area of high pressures which occupied the ocean between 40° and 50° N. After the passage of the above depressions an increase of pressure set in and the area of barometric maxima gradually spread over the ocean, the pressure continuing greatest over mid-ocean and least on the Banks of Newfoundland. The passage of a depression which was moving north of the fiftieth parallel, during the 18th, 19th and 20th, caused another slight reduction of pressure, principally over the ocean west of 30° W., until the 24th, when the high area again began to spread westward and continued, with slight fluctuation, until the closing days of the month.

The report of Captain I. L. Delap, of the bark "Mistletoe," shows the weather over the Atlantic during July, 1885, to have been unusually moderate, while many other vessels reported generally pleasant weather. The "Mistletoe" was bound from New York to Dunkirk, France, and during July sailed between 40° and 50° N., and from 50° W. to the English channel. Captain Delap remarks as follows: "From the 1st to 10th had very moderate, variable winds and generally smooth sea; on the 10th the wind hauled from wsw. to e., and increased to a moderate gale, with heavy and continual rain for twenty-four hours. The balance of the month was the most uniform weather I ever experienced; moderate winds, calms, and occasional fogs; through the channel had easterly winds, at times strong. I have never experienced the same weather in July in twenty-five years, a large portion of which was spent in the north Atlantic."

The following are descriptions of the depressions charted:

1.—Prior to the 6th an area of high pressures appears to have occupied the ocean between W. 50° and the European coasts and to have extended northward to the fifty-fifth parallel; on that date, however, a decrease of pressure occurred over the region north of 47° N., indicating the presence of a centre of depression probably far to the northward. The storm-centre cannot be located at the present writing, owing to the scarcity of reports from the northeastern part of the Atlantic, but it apparently remained north of 55° until the 10th, when it passed to the north of Scotland. The s. s. "State of Nevada," J. A. Stewart, commanding, came under the influence of this disturbance during the period from the 5th to the 9th, and reported fresh w. and sw. winds, increasing to moderate gales with rainy weather and high confused sea, barometer falling to 29.54 (750.3), at 11 a. m. of the 6th, in N. 55° 20', W. 10° 0'. After rising to 29.76 (755.9) the barometer again fell to 29.54 (750.3), at 2 p. m. on the 7th, in N. 53° 45', W. 21° 0', and the wind suddenly shifted from wnw. to n. on the morning of the 9th. On the 7th the s. s. "Grecian," C. E. LeGallais, commanding, had barometer 29.46 (748.3), wind wnw., force 9, in N. 56° 45', W. 29° 30', and on the following day the same vessel, in N. 56° 24', W. 36° 3', had barometer 29.5 (749.3), wind wnw., force 6. On the 10th the bark "Jacob," A. Linder, commanding, in N. 60° 57', W. 14° 0', reported barometer 29.35 (745.5), wind sw., force 8, rainy and squally weather.

2.—This depression appeared on the 8th, near N. 40°, W. 47°, when the pressure in that neighborhood fell to 29.9 (759.4), being a decrease of about .4 inch since the preceding day. The disturbance moved slowly eastward, and on the 9th the lowest readings, about 29.6 (751.8), were shown near N. 41°, W. 45°. On the 10th the storm-centre was apparently to the northwestward of the Azores, causing moderate ne. to e. gales over the ocean between N. 40° and 46° and W. 30° and 40°; after this date the depression appears to have filled in, and an area of high barometer occupied the region between N. 40° and

50° on the 11th. The following reports refer to the passage of this depression: the s. s. "India," J. J. von Holdt, commanding, in N. 42° 0', W. 44° 37', at noon of the 8th had s. to se. winds of force 6 to 7, with rainy, threatening weather and falling barometer; at 9.45 p. m. the ship was struck by a heavy gale from nne. to n. and was obliged to run before the gale; the barometer fell to 29.7 (754.4), and at midnight the wind moderated and the barometer began to rise. On the 9th the s. s. "Catalonia," A. McKay, commanding, at 1 a. m., in N. 40° 52', W. 46° 16', had a heavy gale from sw. to wnw., with very fierce squalls, heavy rain, and confused sea; the gale lasted four hours, the barometer falling from 30.13 (765.3) to 29.67 (753.6). During the 9th and 10th the s. s. "Alexandria," W. Ramsay, commanding, had a gale beginning at s. and sw. and shifting suddenly to nw., with heavy rain; the lowest barometer, 29.7 (754.6), was observed at 1 a. m. on the 10th, in N. 40° 6', W. 38° 20'. The s. s. "Australia," A. McRitchie, commanding, reported fresh to moderate e. breeze, with heavy rain, on the early morning of the 8th; at 6 a. m., wind ene., strong breeze, and heavy rain; 8 a. m., calm and overcast, with high, confused sea; 10 a. m., wind s., moderate; noon (N. 40° 27', W. 47° 35'), increasing breeze; 3 p. m., moderate to fresh wsw. breeze; 8 p. m., fresh gale with heavy rain and high sea, barometer 29.62 (752.3); 10 p. m., wind w., fresh gale, heavy squalls, and vivid lightning in the south; wind backing to sw. and thence to sse.; midnight, strong s. gale. The 9th began with a strong s. gale, with rain and high, confused sea; at 2 a. m., wind se.; 4 a. m., strong breeze from ene., with hard squalls and heavy rain; 8 a. m., wind ene., moderate breeze, showery; noon (N. 41° 45', W. 42° 40'), barometer 29.75 (755.6), wind ene., fresh.

3.—This was probably a continuation of the depression described as number vii. under "Areas of low barometer." It reached the Gulf of Saint Lawrence on the night of the 17th, the barometer at Anticosti reading 29.58 (751.3) at the midnight report of that date. On the 18th the storm-centre passed over Newfoundland, and a general decrease of pressure set in over the ocean from the Banks of Newfoundland northeastward. During the 19th and 20th the disturbance moved northeastward north of the fiftieth parallel, causing strong sw. and w. breezes to moderate gales over the ocean between N. 50° and 45°, with pressure ranging from 29.6 (751.8) to 29.9 (759.4).

4.—This was a continuation of low area viii. described under "Areas of low barometer;" it passed into the Atlantic from the coast of Nova Scotia during the 21st, and on the 22d it was shown near, N. 42°, W. 58°, where the barometer read about 29.6 (751.8). On the 23d the depression was near N. 44°, W. 45°, with pressure unchanged, and by the following day it had apparently filled in. Strong breezes accompanied the passage of this depression, the only vessel reporting a gale being the s. s. "Catalonia," which reported: "a gale, lasting four hours, accompanied by heavy squalls, suddenly sprang up at 6 p. m. on the 22d, in N. 41° 45', W. 46° 38'; the wind veered from sw. through nw. to e. and then backed to ne.; heavy rain showers and confused sea; barometer falling from 29.95 (760.7) to 29.62 (752.3)."

5.—This depression appeared to the northeastward of Newfoundland on the 27th, with pressure below 29.8 (756.9), and causing strong breezes to moderate gales from s. and sw. over the Banks. It moved northeastward, with slightly decreased pressure, and on the 28th it was shown near N. 54°, W. 33°; on that date the s. s. "Siberian," R. P. Moore, commanding, in N. 56° 8', W. 34° 0', reported that the wind veered from sw. to s., and rapidly increased to a strong gale, accompanied by heavy rain and very confused sea, the barometer falling to 29.72 (754.9); at 6 p. m. the wind hauled gradually to w. and decreased to a moderate breeze. At 2.30 p. m. of the 29th the s. s. "Geiser," F. V. Schierbeck, commanding, had a moderate gale from se. by s. to nw., the lowest barometer reading being 30.0 (761.9), in N. 54° 14', W. 29° 17'. On the 29th the disturbance passed beyond the range of the observations.

6.—This depression appeared off the eastern edge of the Banks on the last day of the month; the pressure over the region between N. 45° and 50° and W. 40° and 45° had decreased to 29.6 (751.8), being a fall of about .5 inch, and the southerly winds had increased to the force of a gale. The s. s. "Waesland," J. Ueberweg, commanding, had a moderate gale from se., veering to s., sw. and wnw.; the lowest barometer reading, 29.83 (757.7), was observed at 2 p. m. on the 31st, in N. 44° 18', W. 42° 40'. The disturbance appears to have increased in energy as it moved eastward; the s. s. "Geiser," F. V. Schierbeck, commanding, reported a storm of force 10, during July 31st and August 1st; the gale began at sse., backed to e. by s., and then veered to se. and sw., and moderated at wsw.; the lowest barometer reading, 29.64 (752.8), occurred at 5.30 p. m. on the 31st, in N. 47° 44', W. 39° 10'. Captain Schierbeck remarks as follows: "This disturbance set in very suddenly, was accompanied by a heavy rainfall and had quite the appearance of a cyclone; the wind blew occasionally with great force, and the flying mist and spray made it impossible to see a ship's length ahead."

OCEAN ICE.

On chart i. are also shown the eastern and southern limits of the north Atlantic ice-region for July, 1885. These limits are determined from reports furnished by shipmasters, and from trustworthy data published in the "New York Maritime Register" and other newspapers.

In July, 1885, the easternmost icebergs were reported near the forty-fourth meridian and between the parallels of 48° and 50° N.; from N. 48°, W. 44° the eastern edge of the ice region extends south-southwestward to about N. 42° 30', W. 46° 12' (the southeasternmost berg). The southern limit of the ice region runs westward between N. 42° and 43° to about W. 50°, and thence northwestward to Cape Race. Numerous icebergs were reported in the Strait of Belle Isle, and from there eastward to about the forty-ninth meridian. In the southern part of the ice region they were most numerous between N. 42° 30' and 44°, and W. 49° and 52°.

A comparison with the chart for the preceding month (June, 1885), shows that the icebergs of the present month are considerably diminished in number and that the area of water covered by them is much smaller, the eastern limit being two and a half or three degrees to the west, and the southern limit about three degrees to the north of the corresponding limits for last month.

The following table shows the comparison between July, 1885, and the same month of the three preceding years:

Southern limit.			Eastern limit.		
Date.	Lat. N.	Lon. W.	Date.	Lat. N.	Lon. W.
	° /	° /		° /	° /
July, 1882.....	40 00	49 00	July, 1882.....	40 00?	40 00
July, 1883.....	42 42	49 57	July, 1883.....	46 47	45 44
July, 1884.....	46 24	50 02	July, 1884.....	48 36	40 28
July, 1885.....	42 14	48 30	July, 1885.....	48 00	44 00

Icebergs were reported in July, 1885, as follows:

1st.—Bark "Iodine," off Ivigtut, Greenland, saw several small icebergs; ship "Bedford," in N. 44° 27', W. 49° 0', passed an iceberg.

2d.—S. S. "Suevia," in N. 42° 56', W. 49° 0', at 11.45 a. m., passed an iceberg; also, at 1.20 p. m., in N. 42° 50', W. 49° 24', passed two bergs.

4th.—S. S. "State of Alabama," in N. 48° 0', and between W. 44° and 46° 30', passed several icebergs; s. s. "Wyoming," in N. 43° 30', W. 50° 00', at 7.30 a. m., passed two icebergs.

5th.—S. S. "State of Alabama," in N. 45° 41', W. 49° 50', passed an iceberg; ship "Hermon," in N. 42° 40', W. 49° 2', passed three large icebergs; temperature of water 42°.

6th.—S. S. "Island," in N. 44° 30', W. 49° 16', passed a large iceberg and several pieces; temperature of air, 57° 2; water, 53° 6.

7th.—S. S. "City of Chester," in N. 42° 53', W. 51° 30', passed an iceberg four hundred feet high and six hundred feet long; temperature of air, 54°; water, 53°; bark "Iodine," in 51° 50', W. 48° 0', to N. 49° 25', W. 47° 0', on the 8th, passed several small icebergs.

8th.—S. S. "Celtic," in N. 44° 15', W. 49° 12', at 2.30 p. m., passed three small icebergs.

9th.—S. S. "Ethiopia," in N. 48° 14', W. 48° 55', at 3.15 p. m., passed an iceberg; s. s. "Ontario" passed several large icebergs in Belle Isle Strait; also, three small icebergs about one hundred and eighty-six miles east of Belle Isle.

10th.—S. S. "Siberian," when in the Strait of Belle Isle, passed several icebergs between Point Amour and Cape Norman; from Cape Norman to Belle Isle she passed twenty-seven bergs, some of which were very large.

11th.—S. S. "Hibernian," in N. 43° 30', W. 49° 40', passed a moderate-sized iceberg; s. s. "Bothnia," in N. 43° 18', W. 49° 36', passed a large iceberg; also another about seven miles west of the first; in N. 43° 18', W. 51° 12', passed another; bark "J. P. A.," in N. 42° 26', W. 50° 40', passed an iceberg about two hundred and fifty feet high and ten miles long; s. s. "Siberian," between Belle Isle and N. 53° 20', W. 48° 50', passed numerous icebergs; s. s. "Circassian" passed numerous icebergs from Belle Isle to about one hundred and eighty miles east of that island.

12th.—S. S. "Fulda," in N. 42° 29', W. 50° 8', passed a small iceberg; s. s. "Main," in N. 48° 1', W. 44° 23', passed a small iceberg.

15th.—S. S. "Assyrian Monarch," passed a small iceberg twenty miles southwest of Cape Race; s. s. "Adriatic," in N. 44° 55', W. 48° 56', passed a large iceberg; also passed another, with several small pieces, in N. 44° 53', W. 49° 5'; s. s. "Furnessia," in N. 47° 50', W. 45° 30', at 3.15 p. m., passed an iceberg; at 7.15 p. m., in N. 47° 40', W. 46° 0', passed another.

16th.—S. S. "Samaria," in N. 43° 3', W. 49° 37', passed a large iceberg; s. s. "Venetian," in N. 43° 8', W. 51° 25', passed a large iceberg—a solid mass about two hundred feet high, five hundred feet long, and four hundred feet wide; also saw a small berg about three miles north.

17th.—S. S. "State of Pennsylvania," in N. 48° 16', W. 44° 17', passed a large iceberg about ten miles south of ship.

18th.—S. S. "Nevada," in N. 43° 52', W. 51° 56', passed a large iceberg apparently aground; s. s. "Roman," in N. 42° 41', W. 50° 10', at 9.30 p. m., passed two large icebergs.

19th.—S. S. "Elysia," in N. 43° 2', W. 49° 30', at 2.30 p. m., passed a large iceberg; at 4.45 p. m., in N. 43° 0', W. 50° 0', passed another with several small bergs near it.

21st.—S. S. "Indipendente," in N. 42° 50', W. 50° 22', passed five large icebergs.

22d.—S. S. "Britannic," in N. 42° 50', W. 49° 56', at 3.45 p. m., passed a small iceberg; at 4.45 p. m., in N. 42° 45', W. 50° 16', passed one large berg and several pieces; s. s. "Scythia," in N. 43° 03', W. 50° 39', at 4.50 a. m., passed a large iceberg; at 6 a. m., passed a medium-sized berg in N. 43° 02', W. 51° 05'.

23d.—S. S. "Etruria," in N. 42° 21', W. 48° 48', at 12 m., passed a medium-sized iceberg; at 1.45 p. m., passed another in N. 42° 17', W. 49° 09'; s. s. "Nessmore," in N. 42° 14', W. 48° 30', passed an iceberg, air, 50°, water, 44°; in N. 42° 18', W. 49° 00', passed another, with small pieces near it.

24th.—S. S. "Waldensian," in N. 48° 55', W. 44° 09', passed a small iceberg; in N. 48° 48' to 44° 33' passed one large and several small bergs; in N. 47° 45', W. 46° 22', passed a medium-sized berg; s. s. "Jane Breydel," in N. 42° 55', W. 49° 50', at 6 p. m., passed an iceberg, also passed another at 10 p. m., in N. 42° 53', W. 50° 51'; s. s. "State of Georgia," in N. 48° 21', W. 49° 33', sighted an iceberg about fifteen miles north of ship's position; s. s. "Rugia," in N. 43° 15', W. 53° 15', at 5 a. m., passed an iceberg from two to three hundred feet high.

25th.—Bark "Abel," in N. 43° 30', W. 48° 54', passed several icebergs, one about three hundred feet high; s. s. "Iowa,"

in N. 42° 55', W. 50° 2', at 8.30 p. m., passed a medium-sized iceberg; s. s. "Canada," (Fr.) in N. 43° 17', W. 51° 6', passed a large iceberg about three hundred feet high and six hundred feet long.

26th.—S. S. "Iowa," in N. 42° 53', W. 51° 4', at 12.30 a. m., passed a large iceberg.

29th.—S. S. "Circassian," passed twelve icebergs from one hundred and forty miles east of, to, Belle Isle.

30th.—S. S. "Anchoria," in N. 49° 33', W. 44° 5', at 11 a. m., passed two small icebergs; s. s. "Siberian," in N. 53° 9', W. 49° 22', passed an iceberg.

31st.—S. S. "Siberian," in N. 52° 35', W. 52° 15', passed a large iceberg; s. s. "Rhaetia," in N. 42° 34', W. 46° 12', at 12.25 p. m., passed a small iceberg.

The following data are taken from the "Atlantic Ice Reports" of the INTERNATIONAL NAUTICAL MAGAZINE:

1st.—S. S. "Norseman," in N. 44° 29', W. 48° 22', passed some small pieces of ice.

2d.—Bark "Carl Haasted," in N. 43° 0', W. 51° 0', passed one small iceberg.

4th.—Bark "Hugo," in N. 43° 0', W. 52° 25', passed three small icebergs and some small pieces.

6th.—S. S. "Zaandam," in N. 43° 23', W. 49° 37', passed three small icebergs.

7th.—S. S. "Westphalia," in N. 42° 32', W. 50° 53', at 11 a. m., passed a large iceberg about one hundred and fifty feet high; at 1 p. m., in N. 42° 28', W. 51° 33', passed a berg about two hundred feet high.

8th.—Bark "Drowning Louise," in N. 43° 0', W. 49° 30', passed three large icebergs.

9th.—Bark "Drowning Louise," in N. 42° 48', W. 50° 50', sighted two large icebergs.

13th.—S. S. "Tower Hill," in N. 45° 18', W. 48° 52', at 4 p. m., passed an iceberg.

15th.—S. S. "Fitzroy," in N. 43° 27', W. 49° 57', passed two medium-sized icebergs.

17th.—S. S. "Llandaff City," in N. 45° 14', W. 49° 21', at 10 a. m., passed a medium-sized iceberg.

18th.—S. S. "St. Simon," in N. 43° 0', W. 52° 0', at 5.20 a. m., passed an iceberg about one hundred and twenty feet high and half a mile long.

19th.—S. S. "Katie," in N. 43° 13', W. 51° 10', at 1.15 p. m., passed an iceberg about one hundred and eighty feet high and two hundred and fifty feet long; temperature of air, 58°; water, 58°. The s. s. "Edam," in N. 48° 28', W. 46° 0', passed an iceberg about two hundred feet high and four hundred feet long.

23d.—Bark "Annie J. Marshall," in N. 48° 47', W. 45° 30', passed five icebergs.

24th.—S. S. "Critic" sighted two small pieces of ice about five miles from Cape Race.

25th.—Ship "Mary Fraser," in N. 42° 36', W. 50° 0', passed two large icebergs.

29th.—Ship "Austria," in N. 43° 10', W. 52° 0', at 2 a. m., passed a large iceberg.

SIGNAL SERVICE AGENCIES.

Signal Service agencies have been established in the Maritime Exchange buildings at New York and Philadelphia, and in the Custom-House, Boston, where the necessary blanks and other information will be furnished to ship-masters.

In pursuance of the arrangements made with the Meteorological Office of London, England, there were cabled to that office from New York during July, 1885, thirteen reports concerning storms and icebergs encountered by vessels in the Atlantic west of the forty-fifth meridian; seven messages were sent from Boston.

TEMPERATURE OF THE AIR.

[Expressed in degrees, Fahrenheit.]

The distribution of mean temperature over the United States and Canada is exhibited on chart ii. by the dotted isothermal lines; and in the table of miscellaneous meteorological data.

logical data are given the means for the various stations of the Signal Service.

In the following table are given the mean temperatures for the several geographical districts with the normals and departures, as deduced from the Signal Service observations:

Average temperatures for July, 1885.

Districts.	Average for July. Signal-Service ob- servations.		Comparison of July, 1885, with the average for several years.
	For sev- eral years.	For 1885.	
New England	69.4	69.7	+ 0.3
Middle Atlantic states.....	75.4	76.1	+ 0.7
South Atlantic states.....	80.5	80.3	- 0.2
Florida peninsula.....	83.0	82.2	- 0.8
Eastern Gulf states.....	81.0	80.2	- 0.8
Western Gulf states.....	82.5	82.1	- 0.4
Rio Grande valley.....	85.0	84.0	- 1.0
Tennessee.....	79.2	78.4	- 0.8
Ohio valley.....	77.1	77.7	+ 0.6
Lower lake region.....	71.5	71.6	+ 0.1
Upper lake region.....	67.1	67.2	+ 0.1
Extreme northwest.....	66.4	66.7	+ 0.3
Upper Mississippi valley.....	75.5	76.5	+ 1.0
Missouri valley.....	73.3	74.7	+ 1.4
Northern slope.....	66.8	66.3	- 0.5
Middle slope.....	74.8	74.0	- 0.8
Southern slope.....	80.1	79.0	- 1.1
Southern plateau.....	79.4	79.8	+ 0.4
Middle plateau.....	73.0	73.3	+ 0.3
Northern plateau.....	70.9	72.8	+ 1.9
North Pacific coast region.....	64.4	66.7	+ 2.3
Middle Pacific coast region.....	66.8	67.3	+ 0.5
South Pacific coast region.....	75.9	77.0	+ 1.1

The mean temperature for July, 1885, throughout the country has differed very slightly from the normal. In but six of the twenty-three districts in the above table have the average departures exceeded 1°, viz., north Pacific coast region, +2°.3; northern plateau, +1°.9; Missouri valley, +1°.4; south Pacific coast region, +1°.1; Rio Grande valley, -1°.6; southern slope, -1°.1.

In the table of miscellaneous meteorological data are given the means and departures for the several stations, and on chart iv. the departures are exhibited by lines connecting stations of equal departure. The greatest departures are reported from the following Signal Service stations: Olympia, Washington Territory, +3°.5; Mackinaw City, Michigan, +3°.4; Huron, Dakota, +3°.3; Port Huron, Michigan, +3°.2; Cape Mendocino, California, and Fort Bennett, Dakota, +2°.9; Pittsburg, Pennsylvania, +2°.6; Des Moines, Iowa, +2°.4; Dayton, Washington Territory, +2°.3; San Francisco, California, and Little Rock, Arkansas, +2°.2; San Antonio, Texas, -4°.1; Oswego, New York, -3°.3; Sanford, Florida, -2°.9; Fort Davis, Texas, -2°.5; Fort Benton, Montana, and Mobile, Alabama, -2°.4; Montgomery, Alabama, -2°.2.

HIGH TEMPERATURES.

New York City: numerous cases of sunstroke occurred on the 8th, 9th, and from the 16th to 22d; the maximum temperature for the month, 95°.9, occurred on the 21st.

Albany, New York: on the 17th the temperature rose to 96°.6, which is the highest recorded since establishment of this station.

West Las Animas, Colorado: the highest temperature (105° 2) recorded since the establishment of this station in 1881, occurred on the 15th.

Block Island, Rhode Island: the maximum temperature, on the 18th, 87° 8, is the highest on the records of this station.

New London, Connecticut: on the 18th the temperature rose to 92° 4, which is the highest recorded at this station since July 19, 1878.

Baltimore, Maryland: the highest temperatures of the month, 98° 3 and 98° 7, occurred on the 20th and 21st, respectively; during the week ending with the 25th, eighteen fatal cases of sunstroke occurred.

Dubuque, Iowa: on the 20th out-door work was suspended on account of the intense heat. On the 30th the temperature rose to 97° 1, which is the highest recorded since 1874; the intense heat caused an almost total suspension of out-door work.

Dayton, Washington Territory: the 28th was the warmest day of which there is record at this station; the temperature rose to 102° 6.

Milwaukee, Wisconsin: the highest temperature, 92° 8, that has occurred since August, 1881, was recorded on the 28th.

Fort Sully, Dakota: on the 29th the temperature rose to 104° 5. Des Moines, Iowa: intensely hot weather prevailed on the 30th. The temperature rose to 100° 1, which is the highest ever recorded here in July. Several cases of sunstroke occurred.

Yankton, Dakota: the 30th was the hottest day of the season, to date; maximum temperature, 100° 7.

Huron, Dakota: the 28th, 29th, and 30th are considered to have been the hottest days experienced in this region for many years.

Vevay, Switzerland county, Indiana: during the month the temperature reached 90°, or above, on seventeen days.

Manchester, Delaware county, Iowa: many persons were prostrated by the heat on the 30th.

RANGES OF TEMPERATURE.

The monthly, and the greatest and least daily ranges of temperature are given in the table of miscellaneous data. The monthly ranges were greatest in the upper Missouri valley and Rocky mountain districts, the maximum range, 67° 2, occurring at Phoenix, Arizona; they were least at stations on the Gulf coast, the minimum, 18° 0, occurring at New Orleans, Louisiana.

The following table shows the mean temperature for July, 1885, with the normals and departures, as reported by voluntary observers. It is desirable that all voluntary observers, whose observations cover a series of years, should deduce from their records temperature and precipitation normals for the purpose of comparison, as in the table below:

Stations.	County.	Normal tem- perature for July.	Number of years.	Mean tem- perature for July, 1885.	Departure.
<i>Arkansas.</i>		0	0	0	0
Lead Hill.....	Boone.....	78.9	3	82.7	+3.8
<i>Dakota.</i>					
Webster.....	Day.....	75.4	3	74.8	-0.6
<i>Georgia.</i>					
Milledgeville.....	Baldwin.....	80.6		80.6	0.0
<i>Illinois.</i>					
Anna.....	Union.....	78.8	10	79.0	+0.2
Riley.....	McHenry.....	70.5	24	71.8	+1.3
Collinsville.....	Madison.....	79.2		74.2	-5.0
Sycamore.....	DeKalb.....	70.3	4	71.6	+1.3
Sandwich.....	DeKalb.....	73.4	34	76.0	+2.6
Mattoon.....	Coles.....	77.7	5	79.2	+1.5
<i>Indiana.</i>					
Logansport.....	Cass.....	77.6	26	77.6	0.0
Vevay.....	Switzerland.....	78.4	21	78.4	0.0
Spiceland.....	Henry.....	74.4	31	76.1	+1.7
Mauzy.....	Rush.....	72.1	5	73.4	+1.3
<i>Kansas.</i>					
Wellington.....	Samuel.....	77.2	7	76.6	-0.6
Lawrence.....	Douglas.....	78.2		77.1	-1.1
Independence.....	Montgomery.....	78.4	14	78.2	-0.2
Yates Centre.....	Woodson.....	77.7	5	78.2	+0.5
Manhattan.....	Riley.....	78.7	35	77.5	-1.2
<i>Maine.</i>					
Gardiner.....	Kennebec.....	68.7	49	67.2	-1.4
<i>Maryland.</i>					
Fallston.....	Harford.....	75.0	11	74.6	-0.4
<i>Massachusetts.</i>					
Somerset.....	Bristol.....	74.6		75.6	+1.0
Worcester.....	Worcester.....	71.1	45	68.9	-2.2
<i>Missouri.</i>					
Saint Louis.....	Saint Louis.....	79.1	48	80.9	+1.8
<i>Nevada.</i>					
Carson City.....	Ormsby.....	71.6		72.3	+0.7
<i>New Jersey.</i>					
South Orange.....	Essex.....	73.5	15	73.4	-0.1
<i>New York.</i>					
North Volney.....	Oswego.....	69.6	18	69.7	+0.1
Palermo.....	Oswego.....	69.3	32	67.5	-1.8
<i>Ohio.</i>					
Waucon.....	Fulton.....	72.4	15	74.4	+2.0
<i>Pennsylvania.</i>					
Dyberry.....	Wayne.....	68.2	18	69.2	+1.0
Wellsborough.....	Tioga.....	71.3	4	71.5	+0.3
<i>Texas.</i>					
New Ulm.....	Austin.....	82.6	14	81.5	-1.1
<i>Vermont.</i>					
Woodstock.....	Windsor.....	68.0	18	68.7	+0.7
<i>Virginia.</i>					
Dale Enterprise.....	Rockingham.....	75.6	5	79.9	+4.3
Bird's Nest.....	Northampton.....	79.3	10	83.0	+3.8
<i>West Virginia.</i>					
Helvetia.....	Randolph.....	70.1	9	69.5	-0.6
<i>Wisconsin.</i>					
Beloit.....	Rock.....	72.9	36	73.3	+0.4

MONTHLY WEATHER REVIEW.

JULY, 1885.

Table of comparative maximum and minimum temperatures for the month of July.

State or Territory.	Station.	For 1885.		Since establishment of station.			
		Max.	Min.	Max.	Year.	Min.	Year.
Alabama	Montgomery	96.0	63.1	106.9	1881	60.8	1882
Do	Mobile	94.0	66.0	101.0	1883	63.8	1882
Arizona	Prescott	98.5	47.6	103.0	1878	42.0	1879
Do	Yuma	100.0	64.6	101.3	1884	61.0	1882
Arkansas	Little Rock	98.6	63.8	104.5	1884	61.0	1882
Do	Fort Smith	78.0	54.0	83.0	1887, 1884	49.0	1884
California	San Francisco	81.8	57.6	86.0	1877	53.7	1873
Do	San Diego	97.3	50.3	102.3	1874	42.0	1876
Colorado	Denver	97.3	50.3	102.3	1879	18.0	1879
Do	Pike's Peak	93.5	50.3	95.0	1876	51.0	1879
Connecticut	New Haven	92.4	53.0	93.0	1876, 1876	51.0	1884
Do	New London	96.0	45.7	104.0	1881	37.5	1887
Dakota	Fort Buford	100.7	47.8	103.0	1883	44.0	
Do	Yankton	98.0	54.5				
Delaware	Cape Henlopen			91.0	1880	59.0	1882
Do	Del. Breakwater			102.0	1879	50.1	1884
Dist. of Columbia	Washington City	94.8	70.6	104.0	1879	68.0	1877, 1879
Florida	Jacksonville	93.5	73.3	97.0	1880	72.7	1883
Do	Key West	91.2	59.0	99.0	1880	53.0	1876
Georgia	Atlanta	95.2	65.4	105.0	1879	66.0	1880
Do	Savannah	98.5	50.6	106.0	1877	41.0	'80, '81, '82
Idaho	Boise City	99.3	53.1	104.8	1882	48.0	1873
Illinois	Lewiston	93.9	52.6	99.0	1874	50.0	1883
Do	Chicago	95.8	62.1	99.0	1874, 1881	60.0	1882
Do	Cairo	94.5	47.5	101.0	1881	53.0	
Indiana	Indianapolis	92.4	53.4				
Do	Greencastle	96.0	60.0				
Indian Territory	Fort Supply	100.0	62.5	106.0	1881	56.0	1880
Do	Fort Sill	97.1	51.7	101.0	1874	50.4	'73, '80, '83
Iowa	Dubuque	99.0	58.0	100.0	1874	56.0	1882
Do	Keokuk	98.0	50.0	104.0	1874	53.5	1877
Kansas	Leavenworth	97.3	56.6	108.0	1876	50.0	1882
Do	Dodge City	97.2	54.0	102.0	1874	57.0	1882
Kentucky	Louisville	92.5	74.5	96.0	1877	69.8	
Louisiana	New Orleans	99.7	69.2	107.0	1875	64.0	'77, '80, '82
Do	Shreveport	77.0	49.0	86.0	1873, 1880	45.0	1882, 1884
Maine	Eastport	86.8	53.7	97.0	1876	51.0	1876, 1882
Do	Portland	98.7	56.0	99.0	'76, '79, '80	59.0	1874
Maryland	Baltimore	92.8	51.4	101.0	1880	46.0	1876
Massachusetts	Boston			94.5	1876	49.0	1883
Do	Springfield	88.8	46.4	100.0	1878	40.3	1872, 1883
Michigan	Marquette	89.5	54.4	100.0	1878	50.0	1881, 1883
Do	Detroit	91.1	39.2	92.5	1881	40.0	1873
Minnesota	Saint Vincent	94.7	55.0	100.0	1883	46.0	1881
Do	Saint Paul	98.7	64.4	100.0	1878, 1881	62.0	1876
Mississippi	Vicksburg	96.6	60.0	104.0	1881	57.0	1881
Missouri	Saint Louis	96.0	41.3	95.0	1882	35.0	1882
Montana	Fort Assinaboine	100.0	44.3	103.0	1881	42.0	1877, 1882
Do	Fort Custer	97.6	48.0	107.0	1877	45.0	1873
Nebraska	North Platte	97.8	55.2	105.0	1874	51.0	1877, 1878
Do	Omaha	92.4	42.0	104.0	1877	37.0	1880
Nevada	Winnemucca			98.0	1878	43.0	1883
Do	Pioche	99.4	35.5	72.0	1881	27.0	1880
New Hampshire	Mount Washington	90.7	58.4	100.0	1876	50.0	1880
New Jersey	Sandy Hook	88.5	61.0	91.0	1872	56.0	1872, 1880
Do	Cape May	88.5	53.0	95.5	1878	46.0	1876
New Mexico	Santa Fe	87.4	48.3	90.0	1876	47.5	1873, 1882
Do	Buffalo	95.9	56.3	99.0	1879	57.0	1881
Do	New York City	95.0	56.1	101.0	1879	60.0	1881
North Carolina	Charlotte	89.0	60.2	100.0	1879	61.0	1882
Do	Smithville	90.6	53.0	103.5	1881	58.2	1883
Ohio	Cincinnati	90.1	53.0	96.0	1878	49.0	1879
Do	Cleveland	100.8	46.3	97.0	1880	46.0	1875, 1880
Oregon	Roseburg	90.0	49.1	95.5	1875	52.0	1883
Do	Portland	89.8	53.0	94.0	1876	50.0	1883
Pennsylvania	Erie	97.0	50.9	100.0	1876	56.0	1883
Do	Philadelphia	87.8	55.3	80.0	1881, 1882	55.0	1879
Rhode Island	Block Island			92.0	1878	53.5	'76, '81, '82
Do	Newport	94.5	66.0	104.0	1881	59.3	1882
South Carolina	Charleston	96.1	57.8	101.2	1879	53.0	1881
Tennessee	Nashville	94.0	52.2	100.0	1881	53.0	1880
Do	Knoxville	96.7	58.4	110.0	1875	69.0	1880
Texas	Fort Davis	91.5	75.0	97.0	1877	45.0	1880
Do	Galveston	99.7	53.8	98.0	1878	47.0	1875, 1876
Utah	Salt Lake City			96.0	1878	47.0	1876, 1882
Vermont	Burlington	97.0	54.4	101.8	1881	55.0	1876, 1877
Virginia	Lynchburg	96.8	59.4	102.5	1876	60.0	1882
Do	Norfolk	97.0	43.5	93.5	1880	40.0	1881
Washington Ter.	Olympia	102.6	40.6	102.0	1880	37.4	1873
Do	Dayton			97.0	1874	52.0	1875, 1876
West Virginia	Morgantown			95.0	'71, '74, '78	50.0	1880, 1883
Wisconsin	Millwaukee	92.8	51.7		1881	37.6	1882
Do	La Crosse	92.0	55.7	101.0	1874	52.0	
Wyoming	Cheyenne	88.2	48.5	100.5	1881		

FROSTS.

Frosts are reported to have occurred during July as follows:
 On the summit of Pike's Peak, Colorado, on the 25th and 28th.
 Braddock, Summit county, Colorado, from 1st to 9th, 11th, 12th, 14th, 15th, 17th, 18th, 20th, 22d, 23d, 25th.
 Boyne, Charlevoix county, Michigan, 10th.
 Dale Enterprise, Rockingham county, Virginia: light frosts were reported in the lowlands on the 1st and 2d.
 Fort Bridger, Wyoming: light frost occurred on the 15th; heavy frost on the 26th.

The La Crosse (Wisconsin) "Daily Republican," of July 3d, contained the following:

RICHMOND, VIRGINIA, July 3.—A dispatch from Wytheville, Virginia, states that heavy frosts prevailed in that section Tuesday night (June 30th-July 1st), and ice formed at Crockett's Depot, in Wythe county, yesterday morning. It is the first time in the recollection of anyone here that ice has been known to form in this state in the month of July.

PALMYRA, WISCONSIN, July 3.—A heavy white frost fell in this section on Tuesday night (June 30th-July 1st). It is feared the vineyards have suffered therefrom.

PRECIPITATION.

[Expressed in inches and hundredths.]

The distribution of rainfall over the United States and Canada for July, 1885, as determined from reports from more than eight hundred stations, is exhibited on chart iii.

In the following table are shown, for each of the geographical districts, the normal July precipitation for a series of years, the average for July, 1885, and the excess or deficiency as compared with the normal:

Average rainfall for July, 1885.

Districts.	Average for July. Signal-Service observations.		Comparison of July, 1885, with the average for several years.
	For several years.	For 1885.	
	Inches.	Inches.	Inches.
New England	4.42	2.21	-2.21
Middle Atlantic states	4.24	2.93	-1.31
South Atlantic states	5.72	4.63	-1.09
Florida peninsula	5.56	0.25	+0.69
Eastern Gulf states	4.88	5.06	+0.18
Western Gulf states	3.96	4.01	-0.05
Rio Grande valley	1.97	0.75	+1.22
Tennessee	4.03	4.73	-0.71
Ohio valley	4.51	1.90	+2.61
Lower lake region	3.80	3.27	-0.53
Upper lake region	3.50	2.92	-0.58
Extreme northwest	3.22	3.21	-0.09
Upper Mississippi valley	4.14	4.05	-0.09
Missouri valley	4.16	4.09	-0.07
Northern slope	1.86	1.94	-0.08
Middle slope	3.40	3.25	-0.15
Southern slope	3.18	1.71	+1.47
Southern plateau	2.24	1.30	+0.94
Middle plateau	0.36	0.29	-0.07
Northern plateau	0.58	0.19	+0.39
North Pacific coast region	0.70	0.11	+0.59
Middle Pacific coast region	0.06	0.17	-0.11
South Pacific coast region	0.07		

The rainfall for the month has been decidedly below the average in the southern slope, Rio Grande and Ohio valleys, and on the Atlantic coast from South Carolina northward, the departures being most marked in the Ohio valley and New England. While the average for several districts, viz., the Gulf states, middle slope, and the upper Mississippi and Missouri valleys, nearly corresponds with the respective normals, the precipitation has been of very uneven distribution, there being marked departures, both above and below the average, in the same districts. At Montgomery, Alabama, the monthly precipitation, 7.54, exceeded the July average for the last twelve years by 3.89, while the records at Mobile, Alabama, and Pensacola, Florida, show deficiencies of 2.67 and 4.01 as compared with the normals for fourteen and five years, respectively. In the Missouri valley a deficiency of 2.17 occurs at Yankton, the Mississippi valley a deficiency of 3.29 at Leavenworth, Kansas, the records at these stations covering periods of twelve and four years, respectively. In the upper Mississippi valley deficiencies of 2.27, 2.38 and 3.45 occur at Davenport and Keokuk, Iowa, and Cairo, Illinois, while at La Crosse, Wisconsin, Saint Paul, Minnesota, and Des Moines, Iowa, the monthly precipitation exceeded the average by 3.49, 2.66 and 2.55, respectively.

In the table of miscellaneous meteorological data are given the monthly precipitation, with the departures from the average, at the various Signal Service stations.

The following table shows the average July precipitation,

that for July, 1885, and the excess or deficiency, as reported from certain stations by voluntary observers:

Station.	County.	Average precipitation for July.	Number of years.	Precipitation for July 1885.	Departure.
<i>Arkansas.</i>					
Lead Hill	Boone	8.35	3	8.31	-0.04
<i>Connecticut.</i>					
Hartford	Hartford	4.47	13	5.33	+0.86
<i>Dakota.</i>					
Webster	Day	8.39	3	4.97	-3.42
<i>Illinois.</i>					
Anna	Union	3.96	10	2.19	-1.77
Riley	McHenry	4.04	24	2.07	-1.97
Collinsville	Madison	4.10	2	2.37	-1.73
Sycamore	De Kalb	6.44	4	4.98	-1.46
Sandwich	De Kalb	4.04	31	2.53	-1.51
<i>Indiana.</i>					
Logansport	Cass	4.38	26	4.00	-0.38
Vevay	Switzerland	4.15	21	3.46	-0.69
Spiceland	Henry	4.32	27	1.83	-2.49
Mauzy	Rush	2.89	4	1.50	-1.33
<i>Kansas.</i>					
Wellington	Sumner	4.02	7	4.94	+0.92
Lawrence	Douglas	4.50	17	0.03	-4.47
Independence	Montgomery	4.36	13	5.02	+0.66
Yates Centre	Woodson	3.38	5	11.68	+8.30
Manhattan	Riley	4.69	25	4.99	+0.30
<i>Maine.</i>					
Gardiner	Kennebec	3.37	47	1.73	-1.64
<i>Maryland.</i>					
Fallston	Harford	3.51	11	3.33	-0.18
<i>Massachusetts.</i>					
Somerset	Bristol	3.78	2	2.73	-1.05
Worcester	Worcester	3.11	45	2.10	-1.01
<i>Nevada.</i>					
Carson City	Ormsby	0.11	1	0.00	-0.11
<i>New Jersey.</i>					
South Orange	Essex	4.50	15	4.00	-0.50
<i>New York.</i>					
North Volney	Oswego	3.67	14	4.35	+0.68
Palermo	Oswego	3.30	32	3.85	+0.55
Menand Station	Albany	4.43	3	2.52	-1.90
<i>Ohio.</i>					
Wauseon	Fulton	4.43	13	3.03	-1.39
<i>Pennsylvania.</i>					
Dyberry	Wayne	4.75	14	1.70	-3.05
<i>Texas.</i>					
New Uln	Austin	4.49	14	3.24	-1.25
<i>Vermont.</i>					
Woodstock	Windsor	3.96	17	3.29	-0.67
<i>Virginia.</i>					
Wytheville	Wythe	3.94	21	1.33	-2.61
Dale Enterprise	Rockingham	4.03	5	2.86	-1.17
<i>West Virginia.</i>					
Helvetia	Randolph	4.66	9	4.41	-0.25

SNOW.

Pike's Peak, Colorado: 2d, 3d, 16th, 17th, 20th to 24th.

With the exception of the above, no reports of the occurrence of snow during the month have been received.

The observer at the above station also reports that there remained, at the close of the month, scattering drifts of unmelted snow on the sides of the mountain.

SLEET.

The occurrence of sleet during the month has been reported from but one station, viz., Pike's Peak, Colorado, on the following dates: 1st, 2d, 4th, 5th, 8th, 10th, 19th to 24th, 27th, 28th, 29th.

HAIL.

Fort Yates, Dakota, 3d: a thunder-storm, with heavy rain and hail, occurred between 4.30 and 5 p. m., moving from northwest to southeast. The hail-stones varied in size from one-fourth to one and one-fourth inches in diameter. Crops were slightly damaged.

Chatham, Columbia county, New York: this place was visited by a severe hail storm at about 6.30 p. m. on the 5th. For ten minutes the hail-stones, measuring from one to three inches in diameter, fell thickly and banked up along fences like winter snow drifts. Roofs were damaged, windows destroyed, trees stripped of their foliage, and small animals killed. The damage to roofs and windows is estimated at \$2,000. Total damage \$50,000.

Canajoharie, Montgomery county, New York, 5th: a severe hail storm visited all parts of the Mohawk valley during the afternoon. Windows were broken and all kinds of crops greatly damaged.

Table of excessive, and greatest monthly precipitation—July, 1885.

Station.	Specially heavy.		Largest monthly Amount.	Station.	Specially heavy.		Largest monthly Amount.
	Date.	Amt.			Date.	Amt.	
<i>Alabama.</i>				<i>Minnesota.</i>			
Montgomery			7.54	Park Rapids			6.19
Opelika			6.98	Rochester	8	2.56	
Auburn			6.92	<i>Mississippi.</i>			
Scottsborough			6.40	Waynesborough	8	2.31	7.30
Tuscumbia	11, 12	2.58		Vicksburg	4, 5	1.95	6.61
Gadsden	13	2.00		<i>Missouri.</i>			
<i>Arizona.</i>				Springfield	10, 11, 12	4.57	9.14
Prescott	22, 23	3.25		Protem			8.31
Fort Thomas	21, 22	2.21		Greenfield			8.00
<i>Arkansas.</i>				Lamar	2, 3	5.97	7.75
Lead Hill	2, 3	3.79	8.31	Independence	24, 25	2.95	6.45
Mount Ida	21, 22	2.90	6.40	<i>Montana.</i>			
<i>Colorado.</i>				Poplar River	15, 16	2.76	
Braddock	26	2.15		<i>Nebraska.</i>			
Fort Lyon	10	2.20		Minden			11.79
<i>Connecticut.</i>				Omaha	21, 22	2.20	} 9.24
Hartford	29	2.56		Do	23	2.57	
<i>Dakota.</i>				Do	25	2.74	
Webster	19	2.21		Ashland			7.64
<i>Delaware.</i>				Weeping Water			7.61
Cape Henlopen	26, 27	2.61		Fairbury			7.56
<i>Florida.</i>				Crete			7.35
Manatee	13, 14, 15	6.21	12.54	Syracuse	20, 21, 22	4.00	6.62
Limosa	13 to 16	7.30	9.30	De Witt			6.10
Cedar Keys	14, 15	3.32	9.17	Marquette	1, 2	3.32	
Fernandina	2	2.00	7.62	Do	21, 22	2.19	
Jacksonville	16	2.64	7.16	De Soto	23, 24	2.20	
Tallahassee			6.65	<i>New Hampshire.</i>			
Mayport	12	2.10		Mt. Washington	21, 22	2.02	11.34
<i>Georgia.</i>				Wolfeborough	5	3.39	
Albany	13	2.05	} 9.09	<i>New Jersey.</i>			
Do	24	3.60		Somerville	6, 7	3.31	7.28
Savannah			7.88	<i>New York.</i>			
Way Cross	8	2.00	} 7.55	Oswego	7	2.33	
Do	17	2.00		<i>North Carolina.</i>			
Jesup	23, 24, 25	2.58	7.41	Lenoir	5, 6	2.00	6.70
Millen	24	4.00		Charlotte	13, 14	2.15	6.31
Alapaha	16, 17, 18	2.78		Fort Macon	11, 12	4.39	
Augusta	11	2.70		Weldon	26, 27	3.53	
Thomasville	16	2.20		<i>Ohio.</i>			
Newnan	25, 26	2.19		Jacksonborough	23, 24	3.25	
Dalton	5, 6	2.03		Hiram	24	2.31	
<i>Illinois.</i>				Garrettsville	24	2.21	
Wilton Centre	23	2.19		<i>Pennsylvania.</i>			
Rockford	9	2.10		Grampian Hills	26	2.10	6.14
<i>Indiana.</i>				<i>South Carolina.</i>			
Delphi	21	2.50	6.31	Saint Matthew's	12, 13	3.44	} 8.83
Guilford (near)	21, 22, 23	3.00		Do	25	2.31	
Terre Haute	22, 23, 24	2.50		Yemassee			8.74
Lafayette	24	2.49		Jacksonburg	12, 13	3.20	8.68
Vevay	21, 22	2.12		Hardeeville	4	2.52	7.83
<i>Iowa.</i>				Charleston	21	2.24	7.49
Des Moines			6.55	Alendale			6.49
Cedar Rapids	24, 25	2.45	6.35	Kingstree	18, 19	3.74	
Dubuque			6.35	Columbus	4, 5	2.04	
Monticello			6.16	<i>Tennessee.</i>			
Logan	21	2.40		Knoxville	4, 5	2.37	
<i>Kansas.</i>				Nashville	4	2.25	
Yates Centre	1, 2	6.87	} 11.66	<i>Texas.</i>			
Do	4, 5	2.43		Clarksville	21	3.57	} 7.95
Emporia	1, 2	7.55	10.26	San Antonio	2, 3	3.68		} 6.56
Oswego	1, 2	5.81	8.95	Do	6, 7	2.36	
Salina	1, 2	2.03		Comfort	2	2.58	
Do	30	2.00	7.02	Do	5	2.10	
Sterling	1	2.25	6.88	Austin	6	2.64	
Clay Centre	1, 2	2.21	6.06	Longview Junct.	6	2.21	
Dodge City	1	2.10		Cuero	6	2.20	
Do	26, 27	2.19	6.03	Weimar	6	2.12	
Lawrence			6.03	Waco	5, 6	2.07	
Independence	10, 11	2.37		Dallas	5, 6	2.04	
Sherlock	10, 11	2.32		Corsicana	6	2.00	
Wellington	10, 11	2.14		Huntsville	29	2.00	
W. Leavenworth	25, 26	2.10		<i>Vermont.</i>			
<i>Louisiana.</i>				Newport			6.62
New Orleans	13, 14	1.98	6.15	<i>West Virginia.</i>			
Shreveport	4, 5, 6	3.11		Helvetia	13, 14	2.56	
Luling	30	3.00		<i>Wisconsin.</i>			
Monroe	6, 7	2.02		Embarras	19, 20	3.75	10.45
<i>Maine.</i>				La Crosse	29, 30	3.78	8.51
Cornish	6	2.33	6.64	Franklin	11	2.68	7.61
<i>Massachusetts.</i>				Madison	21	2.21	7.30
Princeton	29	2.09		Prairie du Chien			6.37
<i>Michigan.</i>				Wausau	19, 20	2.26	
Hudson	26	2.10		Manitowoc	8	2.05	
Grand Haven	19	2.02					

occurred over a section of country three or four miles wide by ten miles long during the night of the 9-10th, passing over the lake at Port Hope. Windows were broken and buildings otherwise injured, and crops greatly damaged.

Spokane Falls, Spokane county, Washington Territory, 10th: the severest hail storm ever known in this section occurred at 6 p. m. It lasted fifteen minutes, and hail one inch and a quarter in diameter fell to a depth of about two inches. Great damage resulted to vegetation; windows were broken and other damage done.

Duluth, Minnesota, 12th: between 5 and 6 p. m. several showers of hail fell, the hail-stones being about three-fourths inch in diameter, and fell in sufficient quantities to cover the ground.

Indianapolis, Indiana, 13th: during the thunder-storm on the afternoon of this date a heavy fall of hail, lasting from 6.30 to 6.25 p. m., occurred; the hail-stones were of a variety of irregular shapes, and some of them measured one inch in length by one-half inch in thickness.

Bloomington, McLean county, Illinois, 15th: the vicinity of Saybrook, in this county, was, on the 14th, visited by the severest hail storm known there for years. The storm lasted about fifteen minutes, covering the ground with hail-stones of an unusual size, many of which lay on the ground an hour after the storm abated; great damage was done to the crops.

Moorhead, Minnesota, 15th: during the thunder-storm which occurred at 8.58 p. m. heavy hail fell, lasting eight minutes, the hail-stones being from one-half to one inch in diameter and covering the ground in some places to a depth of two inches or more. Reports show that but little hail fell beyond the limits of this place and Fargo, Dakota. The principal damage done was to gardens, which were in most cases destroyed.

Fort Buford, Dakota, 15th: a thunder-storm, accompanied by a fall of very heavy hail, lasting only about thirty seconds, occurred about 7.30 p. m.

Fort Totten, Dakota, 15th: a very destructive hail storm is reported to have occurred in the vicinity of Niagara, Dakota, during the evening (about 11 p. m.). The path of the storm was about four miles wide and extended from Niagara to Reynolds. The damage to wheat is estimated at \$200,000.

Richardton, Dakota, 15th: a severe wind and hail storm struck Hebron, fourteen miles east of here, destroying houses and crops; at another place, six miles southeast of here, the storm caused total destruction of crops, and wrecked buildings.

Bristol, Sullivan county, Tennessee: a heavy hail storm passed about five miles northeast of this place during the evening of the 19th, doing much damage to crops, and totally ruining some fields of tobacco and corn.

Fort Buford, Dakota, 21st: a thunder-storm, accompanied by hail of very large size, occurred from 4.54 to 5.08 p. m. The hail-stones were as large as goose eggs, breaking all windows of northern exposure and causing considerable damage to the post garden.

Fort Totten, Dakota, 22d: a destructive hail storm occurred about fourteen miles south of this station during the afternoon of this date, causing damage estimated at \$22,000.

Huron, Dakota, 26th: heavy hail is reported to have fallen at points thirteen miles north of here, causing considerable damage to crops.

Fort Bennett, Dakota, 28th: reports from points south of this station state that a heavy rain and destructive hail storm occurred on this date.

La Crosse, Wisconsin, 29th: at 7.35 a. m. a heavy hail storm occurred, lasting fifteen minutes; the size of the hail-stones varied from that of hickory nuts to that of walnuts. Great damage was done to window-glass of southern exposure; the owner of an extensive hot-house within the city limits sustained a loss of \$500. As far as can be ascertained the hail storm covered an area of about ten square miles.

Fort Totten, Dakota, 29th: at 4.45 a. m. scattering hail-stones of large size fell with such force as to split shingles and break window-glass, etc. The hail-stones were from one to one and one-half inches in diameter; the large hail fell for only a

few minutes and was followed by a shower of smaller hail, which continued until 5 a. m. At Minnewaukon, Benson county, nearly all window-glass of northern exposure was broken; the storm travelled in a southeasterly direction and caused great damage to crops. It is reported that at points fifteen miles northward the hail-stones measured nine inches in circumference.

Saint Paul, Minnesota, 30th: a thunder-storm occurred during the afternoon, accompanied by a fall of hail from 6.28 to 6.40; the hail-stones varied in size from one-eighth to one inch in diameter and caused damage by breaking numerous windows in the city.

Other hail storms, of less violence and those of which no particulars were reported, occurred in the various states and territories as follows:

Alabama.—Greensborough, 18th.
Arizona.—San Carlos, 19th; Wilcox, 21st; Prescott, 22d.
Arkansas.—Lead Hill, 5th.
California.—Fort Bidwell, 20th.
Colorado.—Denver, 3d; Pike's Peak, 3d, 13th, 16th, 18th, 21st, 22d; Braddock, 26th, 30th.
Connecticut.—Hartford, 9th; Bethel, 29th.
Dakota.—Fort Yates, 3d, 22d, 23d; Deadwood, 4th; Wentworth, eight miles southeast of station on 4th, 22d; Fort Sully and Webster, 28th.
Idaho.—Coeur d'Alene, 10th.
Illinois.—Chicago, 4th.
Indiana.—Logansport, 13th; Jeffersonville, 30th.
Indian Territory.—Fort Reno, 5th.
Iowa.—West Union, 8th; Muscatine, 8th, 30th; Burlington, 13th; Oskaloosa, 23d; Fort Madison, 30th.
Kansas.—Allison, 4th; Sherlock, 13th; Wyandotte, 14th.
Kentucky.—Louisville, 30th.
Massachusetts.—Princeton, 29th.
Michigan.—Port Huron, 13th.
Minnesota.—Duluth, 8th; Saint Vincent, 11th; Rochester, 12th; Northfield, 16th, 29th; Moorhead, 18th, 29th.
Montana.—Fort Benton, 16th, 19th.
Nebraska.—Crete, 4th.
New Jersey.—Little Egg Harbor, 2d; Dover, 5th, 29th.
New Mexico.—Lava, 2d; Fort Union, 3d, 4th.
New York.—Oswego, 13th; New York City, 25th.
Ohio.—Hiram and Garrettsville, 9th.
Oregon.—Fort Klamath, 27th.
Texas.—Fort Concho, southeast of station, 5th.
Utah.—Frisco, 15th; Salt Lake City, 24th.
Vermont.—Post Mills, 9th.
Wisconsin.—Madison, 8th, 29th; La Crosse, 8th, 30th.
Wyoming.—Fort Bridger, 1st.

COTTON REGION REPORTS.

The following table shows the means of the maximum and minimum temperatures, and the average rainfall for the several cotton districts, for the month of July, 1885, together with the averages for the same districts for July of the three preceding years:

Temperature and rainfall data for the cotton districts, July, 1885.

Districts.	Rainfall.			Temperature.								Extremes for July, 1885.	
	Average for July of three preceding years.	Average for July, 1885.	Departures.	Maximum.				Minimum.					
				Mean for July of three preceding years.	Mean for July, 1885.	Departures.		Mean for July of three preceding years.	Mean for July, 1885.	Departures.			
											Max.	Min.	
New Orleans....	4.41	3.80	- 0.61	93.0	94.2	+ 1.2		73.6	73.7	+ 0.1		105	64
Savannah.....	5.00	5.47	+ 0.47	92.8	93.0	+ 0.2		71.7	72.2	+ 0.5		103	58
Charleston.....	6.28	6.85	+ 0.57	92.4	91.0	- 1.4		70.7	70.2	- 0.5		101	51
Atlanta.....	3.69	3.99	+ 0.30	90.4	91.3	+ 0.9		68.7	69.0	+ 0.3		103	46
Wilmington....	4.69	4.35	- 0.34	91.1	90.9	- 0.2		68.9	68.3	- 0.6		103	40
Memphis.....	4.77	2.88	- 1.89	89.9	91.5	+ 1.6		68.2	70.4	+ 2.2		106	50
Galveston.....	2.24	2.58	+ 0.34	95.3	94.0	- 1.3		73.0	70.9	- 2.1		105	51
Vicksburg.....	5.88	4.89	- 0.99	91.9	93.1	+ 1.2		71.6	69.7	- 1.9		99	47
Montgomery....	4.11	4.54	+ 0.43	92.0	92.2	+ 0.2		68.7	70.0	+ 1.3		105	50
Augusta.....	3.51	3.71	+ 0.20	92.3	93.7	+ 1.4		70.6	69.8	- 0.8		104	33
Little Rock.....	2.75	1.95	- 0.80	92.7	94.0	+ 1.3		67.1	70.4	+ 3.3		105	33
Mobile.....	3.52	4.92	+ 1.40	93.9	93.9	- 0.1		70.6	71.1	+ 0.5		106	55

The rainfall, as compared with the average for July of the past three years, has been deficient in the New Orleans, Memphis, Vicksburg, Little Rock, and Mobile districts; in all other districts there has been an excess. The means of the maximum and minimum temperatures for the several districts have generally been above the average.

TEMPERATURE OF WATER.

The following table shows the highest and lowest temperatures of water observed at the several stations; the monthly ranges of water temperature; the average depth at which the observations were made; and the mean temperature of the air:

Temperature of water for July, 1885.

Station.	Temperature at bottom.		Range.	Average depth, feet and tenths.	Mean temperature of the air at station.
	Max.	Min.			
Atlantic City, New Jersey	80.2	65.2	15.0	4.8	73.3
Alpena, Michigan	74.0	65.3	8.5	13.8	64.7
Augusta, Georgia	84.0	76.1	7.9	6.2	80.7
Baltimore, Maryland	83.4	72.5	10.9	10.3	79.6
Block Island, Rhode Island	71.0	60.2	10.8	6.0	70.6
Boston, Massachusetts	70.1	56.3	13.8	20.4	71.3
Buffalo, New York	75.0	61.1	14.9	9.2	69.5
Canby, Fort, Washington Territory	68.8	62.0	6.8	15.0	60.4
Cedar Keys, Florida	89.3	81.3	8.0	8.3	82.1
Charleston, South Carolina	85.4	79.0	5.8	41.5	81.9
Chicago, Illinois	66.1	59.3	6.8	8.0	72.8
Chincoteague, Virginia	88.0	77.1	20.9	3.0	76.4
Cleveland, Ohio	77.3	67.6	9.7	14.0	71.0
Detroit, Michigan	73.2	72.0	3.2	24.5	74.7
Duluth, Minnesota	67.7	48.7	19.0	10.1	65.2
Eastport, Maine	49.0	43.4	5.6	15.2	61.7
Escanaba, Michigan	72.8	61.7	11.1	18.1	67.6
Galveston, Texas	88.5	85.0	3.5	12.8	84.9
Grand Haven, Michigan	77.9	53.4	24.5	19.0	67.3
Indianola, Texas	88.6	84.5	4.1	8.7	83.6
Jacksonville, Florida	88.9	87.9	1.0	18.0	82.4
Key West, Florida	89.6	86.7	2.9	17.6	84.9
Mackinaw City, Michigan	71.6	59.3	12.3	10.0	65.3
Macon, Fort, North Carolina	87.0	77.0	10.0	7.7	79.5
Marquette, Michigan	66.0	50.6	15.4	8.0	68.4
Milwaukee, Wisconsin	87.0	80.7	6.3	16.0	79.7
Mobile, Alabama	80.2	63.9	16.3	17.2	72.1
New Haven, Connecticut	69.2	59.3	10.9	12.3	71.4
New London, Connecticut	77.8	65.0	12.8	13.8	71.2
New York City	85.7	74.0	12.7	10.3	80.5
Norfolk, Virginia	85.9	81.4	4.5	17.3	81.6
Pensacola, Florida	84.1	53.1	11.0	10.9	67.6
Portland, Maine	73.9	69.7	4.2	57.8	68.0
Portland, Oregon	81.4	69.8	11.6	11.9	74.5
Sandusky, Ohio	74.8	64.0	10.8	2.3	73.7
Sandy Hook, New Jersey	63.1	58.1	5.0	36.2	60.5
San Francisco, California	86.8	81.8	5.0	9.8	82.5
Savannah, Georgia	86.5	79.8	6.7	10.8	80.6
Smithville, North Carolina	82.1	71.2	10.9	13.4	75.3
Toledo, Ohio					
Wilmington, North Carolina					

* Record for first 17 days of month.

† Record for 10 days.

WINDS.

The most frequent directions of the wind during July, 1885, are shown on chart ii. by arrows flying with the wind; with the exception of a few stations, the prevailing winds in all districts east of the one hundredth meridian, were from the south or southwest; on the Pacific coast they were westerly; in the Rocky mountain districts they were variable.

HIGH WINDS.

(In miles per hour.)

On the summit of Mount Washington, New Hampshire, winds of fifty or more miles per hour occurred during the month as follows: 60, nw., 8th; 90 nw., 9th; 65, nw., 10th; 58, nw., 11th; 60, se., 14th; 56, nw., 15th; 96, nw., 17th; 83, w., 18th; 60, nw., 20th; 60, w., 21st; 60, nw., 22d; 54, sw., 24th; 61, nw., 25th; 60, nw., 26th.

Other stations reporting wind velocities of fifty miles or more per hour are as follows:

Pike's Peak, Colorado, 56, w., 5th; 52, w., 15th.
Fort Buford, Dakota, 50, w., 6th.
Poplar River, Montana, 60, n., 16th.
Fort Totten, Dakota, 53, ne., 28th.
Moorhead, Minnesota, 51, n., 29th.

LOCAL STORMS AND TORNADOES.

The "New York Herald," of July 3d, contained the following:

NEW ORLEANS, July 2, 1885.—A special dispatch from Santa Rosa, Mexico, gives an account of a cyclone which passed over that section recently, doing great damage. Colonel Pedro Valdez had his out-houses blown down, and estimates his loss by breaking off and uprooting of sugar cane at several thousand dollars. Where the storm crossed the Sabine river great cottonwood and pine trees were snapped off at the roots or torn up bodily. After the storm had passed the stumps of trees looked like gigantic grass over which a mower had passed. Not a tree was left standing in its course. In San Juan del Sabinas forty houses were blown down and several persons injured. Ranches in the track of the storm were much damaged and many cattle and sheep killed. The track of the storm was four hundred yards wide and its duration from four to five minutes.

White House, Hunterdon county, New Jersey: a very heavy rain storm occurred in this vicinity at about 3 p. m. on the 6th. Rockaway creek rose to a greater height than has been known for many years; several bridges were washed away; much damage was done to crops.

Chattanooga, Tennessee: a severe wind storm is reported to have occurred during the night of the 6-7th in the vicinity of Glenn Station, Alabama, on the Memphis and Charleston railroad. A freight car was blown from the side-track at that place.

Ithaca, Tompkins county, New York: a tornado occurred at 11.30 a. m. on the 7th, passing through the village of Varna, two miles east of Ithaca. The damage to buildings was confined to sheds and other light structures.

Green Bay, Brown county, Wisconsin: a severe storm occurred here between 6 and 7 p. m. on the 8th. The most violent part of the storm was of about thirty minutes duration. Several buildings were damaged by lightning.

Sparta, Monroe county, Wisconsin: a violent storm occurred at this place during the evening of the 8th. Numerous buildings were badly damaged; fourteen cars at the Saint Paul depot were blown from the track; several cars at the North-western depot were also derailed.

Edgerton, Rock county, Wisconsin: more than two hundred tobacco sheds in this vicinity were demolished by the storm on the 8th; dwellings, barns, and other out-buildings were also damaged, and considerable live stock was killed.

At Appleton, Outagamie county, Wisconsin: a church, mill, and a number of residences were destroyed by the storm of the 8th; at Stoughton, Dane county, dwellings, barns, and tobacco sheds were also destroyed, and a number of horses and cattle were killed.

West Salem, La Crosse county, Wisconsin: the storm of the 8th was one of the most severe experienced in this vicinity for many years. Its course, in a narrow path, was from a point about three miles northwest of this place, directly eastward. The appearance of the forest indicates that there were two currents, one from the southwest and the other from the northwest. In one instance, of a fine orchard of fifty trees, about a dozen remained standing, the others having been broken off or torn out of the ground. In Lewis Valley there was a heavy fall of hail, which did great damage to the grain crops.

Cashton, Monroe county, Wisconsin: at about 7 p. m. on the 8th two storms, one coming from the southwest and the other from the northwest, met near the town of Clinton, Vernon county, forming a tornado which moved in an easterly direction, destroying much property in its course.

Neillsville, Clark county, Wisconsin: a severe storm occurred here at about 5.30 p. m. on the 8th; much damage was done to buildings, trees, etc.

Plainfield, Waushara county, Wisconsin: the storm of the 8th was one of the most violent that has ever occurred here. A large number of buildings were blown down or unroofed.

Port Edwards, Wood county, Wisconsin: a store, mill, and five dwellings at this place were destroyed by the storm of the 8th. At Dexterville, in this county, the damage by wind and lightning is estimated at \$5,000.

Waupaca, Waupaca county, Wisconsin: a destructive storm

of wind and rain occurred at this place during the evening of the 8th; much damage was done to buildings, forests, and crops.

La Crosse, Wisconsin: heavy rain, with thunder and lightning, prevailed from 7.30 to 9.20 p. m. on the 8th. For five minutes the wind blew at the rate of forty-eight miles per hour. Much damage was done to the crops in the surrounding country. On the 28th light rain fell from 4.40 to 5.15 p. m., accompanied by high wind, the velocity reaching forty-one miles.

Mr. J. Shaw, voluntary observer at Rochester, Olmsted county, Minnesota, reports the following:

A thunder-storm of unusual violence passed over this place during the evening of the 8th. The day had been the hottest and most sultry of the season; the thermometer reading 95° at 3 p. m. At that hour the wind, which had been from the south for about forty-eight hours, shifted to west. At 6 p. m. the clouds had a very threatening appearance and showers approached from the southwest and northwest, meeting about three miles south of this town, and forming a tornado at that point. The first damage was the complete destruction of a fine lot of farm buildings. The course of the tornado was slightly to the north of east, and several buildings in its path for a distance of five miles were destroyed. At the time of the tornado a strong wind prevailed at Rochester, but only a small quantity of rain fell. At 6.10 p. m. the wind changed to north and blew with almost the force of a gale, breaking down many shade trees in and about the town, and very heavy rain fell until 7 p. m., the wind frequently shifting to ne., n., and nw. After 7 p. m. the wind abated and rain gradually ceased; the total rainfall during the storm amounting to 2.56 inches. The grain crops were levelled and seriously damaged. The night passenger train on the Chicago and Northwestern railroad was delayed six hours by a washout near Sparta, Wisconsin.

Kasson, Dodge county, Minnesota: a violent wind and rain storm occurred at this place at about 6 p. m. on the 8th. Trees were prostrated and considerable damage done by lightning.

Oskaloosa, Mahaska county, Iowa: the heaviest rain storm known here for many years prevailed on the 8th, the rainfall amounting to more than five inches. Many bridges were washed away, and bottom lands were overflowed.

Grand Haven, Michigan: a severe thunder-storm prevailed during the night of the 8-9th; the wind reached a velocity of thirty-six miles per hour from the southwest.

Wilkesbarre, Pennsylvania: a violent storm occurred during the evening of the 9th. Several buildings were struck by lightning. In the surrounding country much damage was caused by the high wind and heavy rainfall.

Hartford, Connecticut: a severe storm occurred between 5 and 6 p. m. on the 9th. In East Hartford many trees were uprooted and out-buildings demolished.

Burlington, Vermont: the storm on the afternoon of the 9th caused much damage at this place and at neighboring towns. A large number of buildings were blown down or unroofed, and forests and orchards were badly damaged.

Waterbury, Washington county, Vermont: a severe storm of wind and rain, accompanied by terrific thunder and lightning, occurred during the afternoon of the 9th. A bridge, two hundred and twelve feet in length, across the Winooski river, was blown into the water and completely wrecked, entailing a loss of \$5,000. Considerable damage was also done to buildings, trees, etc. At Waterbury Centre, two children were buried under the debris of a barn which was blown down by the storm.

Charlotte, Chittenden county, Vermont: the severest storm experienced in this vicinity for many years occurred on the afternoon of the 9th. Houses were unroofed and many forest and fruit trees were blown down.

Lowell, Massachusetts: a thunder-storm, accompanied by torrents of rain, occurred in this vicinity on the afternoon of the 9th; much damage was done by lightning during the storm.

Lewiston, Maine: a violent storm occurred here on the afternoon of the 9th. Buildings were injured and other slight damage caused.

Nyack, Rockland county, New York: the barge "William J. Haskett" was caught in a severe storm when near Tomkins

Cove, on the afternoon of the 9th, and sustained serious damage.

Schenectady, Schenectady county, New York: the village of Aquaduct, on the Mohawk river, was struck by a tornado on the afternoon of the 9th. Barns were demolished, and chimneys, trees, etc., blown down. The tornado pursued a direct course for a distance of about two miles, its path being of a uniform width of fifty feet.

Boston, Massachusetts: reports from West Brookfield, Worcester county, state that during the storm of the 9th the roof was blown from a large warehouse and carried a distance of five hundred feet. Much damage was caused by lightning at various points in the state.

Reading, Pennsylvania: a tornado occurred in this (Berks) county during the night of the 9-10th, causing considerable damage to crops and buildings.

Augusta, Georgia: a severe thunder-storm passed over this city from northwest to southeast during the afternoon of the 11th. From 4.30 to 8.40 p. m. 2.70 inches of rain fell. The streets were flooded and numerous trees were blown down.

Lake Minnetonka, Hennepin county, Minnesota: at about 4.30 p. m. on the 12th the yacht "Minnie Cook" was capsized in a severe squall which suddenly swept over the lake. Seven lives were lost. The storm was also very severe at White Bear.

Pittsburg, Pennsylvania: a very destructive storm of wind and rain occurred in the Allegheny valley during the evening of the 13th. Reports state that great damage was done along the river between this place and Titusville. At Freeport it is reported that 4.50 inches of rain fell in one hour, causing the flooding of cellars, etc., and submerging railway tracks. Trains were delayed on account of the washing away of the tracks, and in some places the road-beds were covered with debris five feet in depth.

Fort Supply, Indian Territory: the afternoon of the 13th was warm and sultry; after sunset the wind backed from southeast to north, from which quarter it blew steadily until 11.20 p. m., when it increased to a velocity estimated at not less than forty-five miles per hour; at 11.24 it abated to light, but at 11.28 it increased suddenly to an estimated velocity of sixty miles, accompanied by heavy rain, thunder, and hail. The storm came from the north and was apparently of local character, as reports from points between this place and Fort Elliott, Texas, state that no storm occurred in that section.

Fort Reno, Indian Territory: a thunder-storm prevailed from 11.55 p. m. until 3 a. m. during the night of the 13-14th. Very high wind, in gusts, occurred during the storm. The garrison flag-staff was broken off at its base by the high wind.

Clarksville, Red River county, Texas: a severe wind storm occurred in this vicinity on the 14th; considerable damage was done to crops and orchards.

DeKalb, Bowie county, Texas: the severest rain storm of the year swept over this vicinity on the morning of the 14th. The storm was severest to the west of this place; it lasted about one hour and caused considerable damage to the corn and cotton crops. Large trees were blown down, and in some instances the roadways were completely blocked.

Richardton, Stark county, Dakota: a severe storm of wind and hail occurred at Hebron, fourteen miles east of this place, on the 15th, destroying buildings and crops. The storm was also very destructive at points six miles southeast of Richardton.

Huron, Dakota: at 6.30 p. m. on the 15th a funnel-shaped tornado cloud was observed to the west of this station. At 10.10 p. m. a heavy rain storm occurred, accompanied by incessant lightning and very loud thunder. The storm moved from northwest to southeast.

Owatonna, Steele county, Minnesota: a severe wind and rain storm passed over this vicinity during the night of the 15-16th, destroying a number of shade trees and prostrating fields of grain; much damage was done by lightning.

Red Wing, Moody county, Dakota: a violent wind and rain storm passed over this place at about 2.30 a. m. on the 16th, blowing down trees, etc.

Athens, Clarke county, Georgia: a severe storm passed through this vicinity from southeast to northwest on the 18th; it caused considerable damage to buildings and crops.

Milwaukee, Wisconsin: a thunder-storm, accompanied by very heavy rain, prevailed from 6.40 to 8.25 p. m. on the 19th; no damage was done in this vicinity, but to the northward of station the storm was very severe. A maximum wind velocity of thirty-six miles from the northwest occurred at 7.30 p. m.

New Britain, Hartford county, Connecticut: a storm of unusual severity occurred at 4 p. m. on the 21st. In the upper part of the town about one hundred trees were blown down.

Archer, Alachua county, Florida: a severe storm, blowing down buildings, trees, etc., occurred here at 3.30 p. m. on the 21st.

Muncie, Delaware county, Indiana: a severe storm of wind and rain passed through the southeastern part of this county during the evening of the 22d. The growing crops were seriously injured and out-buildings, fences, etc., were blown down.

Columbus, Ohio: a severe storm passed over this city from northwest to southwest during the afternoon of the 22d. Although the velocity of the wind in the city did not exceed twenty miles per hour, at points two miles distant the storm assumed the character of a tornado, uprooting trees, etc.

Richardton, Stark county, Dakota: at 4 p. m. on the 23d a violent storm of wind and hail completely destroyed the crops over a strip of country six miles in length, south of Richardton.

Omaha, Nebraska: a very severe thunder-storm moving from southeast to northwest, occurred at this station between 1.43 and 2.10 a. m. on the 25th. The rainfall was remarkably heavy and caused considerable damage.

Lancaster, Pennsylvania: the storm on the night of the 26-27th, was very severe in this vicinity. The corn and tobacco fields were badly washed, entailing a heavy loss.

Moorhead, Minnesota: reports from the surrounding country state that the crops were badly damaged by a severe storm on the morning of the 28th. Threatening clouds were observed to the northwest of station, but no storm occurred at this place. A violent thunder-storm from the northwest occurred at about 7 a. m. on the 29th; from 7.45 to 7.50 a. m. the wind blew at the rate of sixty miles per hour. This latter storm is considered one of the severest ever experienced here, and caused much damage in the city and vicinity. Buildings were unroofed, trees uprooted, and crops in the surrounding country were badly damaged. Much damage was done by lightning both at Moorhead and Fargo, Dakota.

Doylestown, Bucks county, Pennsylvania: shortly after 4 p. m. on the 29th a tornado passed over the western part of Hilltown, in this county, causing the destruction of buildings, fences, etc.

Dubuque, Iowa: a severe storm, accompanied by heavy rain, occurred here during the evening of the 29th, causing much damage to buildings in course of erection.

Louisville, Kentucky: from 4.30 to 8.32 p. m. on the 30th a thunder-storm, accompanied by very heavy rain, prevailed. For ten minutes the wind blew at the rate of thirty-six miles per hour. Small hail fell from 5.02 to 5.07. The temperature fell from 96° 8 to 73°.

The following are reports received from the special tornado observers of the Signal Service, of whom there are more than 1,400:

Strafford, Strafford county, Kansas: a tornado occurred here at 3 p. m., on the 1st. The cloud was funnel-shaped and moved in a northeasterly direction for a distance of three miles, its path being from one hundred to two hundred feet wide. Heavy rain and thunder occurred before and after the passage of the tornado-cloud. A dwelling and barn were destroyed. The shortest time in passing a given point was one minute.

Lind, Waupaca county, Wisconsin: a tornado occurred here at 8 p. m., on the 8th. It was accompanied by an unusual electrical display. Thirty buildings were unroofed or destroyed.

Madison, Wisconsin: a tornado occurred here at 9 p. m., on

the 8th. The cloud was balloon-shaped and moved in a direction from northwest to southeast, its path being about one-half mile in width. One building was destroyed and several were unroofed. The damage is estimated at \$40,000.

Monticello, Wright county, Minnesota: a tornado occurred five miles north of this place at 3.25 p. m. on the 8th. The cloud was funnel-shaped and moved in a direction E. 20° N. for a distance of three miles, and then disappeared. The diameter of the tornado-cloud is reported to have been about fifteen feet, and the direction of the whirl was contrary to the movement of the hands of a watch. One dwelling and an out-building were destroyed.

Oshkosh, Winnebago county, Wisconsin: a tornado occurred twelve miles west of this place at 8 p. m. on the 8th. No damage was reported.

Winona, Winona county, Minnesota: at 5 p. m. on the 8th a tornado-cloud was observed at this place; it did not touch the ground, and disappeared when near the city. A severe storm of wind and rain, accompanied by a brilliant electrical display, followed.

Allegan, Allegan county, Michigan: a tornado occurred here at 11.40 p. m. on the 8th. The tornado cloud moved from southwest to northeast in a path two hundred feet wide. A large barn was destroyed, two others were unroofed, and many trees, fences, etc., were demolished. The damage is estimated at \$10,000.

Kent's Hill, Kennebec county, Maine: a tornado occurred at this place at 4.05 p. m. on the 9th, its path being about eight miles in length. It caused much damage to barns, trees, etc.

West Brookfield, Worcester county, Massachusetts: a tornado occurred here at 4.35 p. m. on the 9th. The cloud was funnel-shaped and moved from southwest to northeast. But little damage was done.

North Springfield, Green county, Missouri: a tornado occurred here at 4 p. m. on the 10th. The cloud was funnel shaped and moved in a southeasterly direction. No damage resulted.

Harold, Hughes county, Dakota: a tornado passed through the villages of Highmore and Holabird, in Hyde county, on the afternoon of the 15th. It started about ten miles north of Harold and then passed through the places above named. The tornado-cloud was funnel-shaped, and moved in a southeasterly direction until reaching Highmore, where its course changed to the eastward. At one time there were eight funnel-shaped clouds visible; all but two of these had disappeared when the storm struck Highmore. Fifteen dwellings and a church were destroyed, and two persons were killed. Damage estimated at \$40,000 was done at Highmore; damage to the extent of \$15,000 was also done at other points in Hyde county.

Upland, Jewell county, Kansas: a tornado occurred here at 5 p. m. on the 26th. At one time there were observed to depend from the front of the storm cloud twenty funnel-shaped clouds; these were constantly varying in form and position. The electrical display was intense in the surrounding clouds, but no electricity was observed in the funnel clouds. The progressive velocity of the storm was estimated at forty miles per hour. No damage resulted, as the storm occurred in an open plain.

NAVIGATION.

STAGE OF WATER IN RIVERS.

In the Arkansas, Mississippi, and Missouri rivers the highest stages at all stations, with one exception, viz., La Crosse, Wisconsin, on the Mississippi, occurred between the 1st and 10th; and the lowest stages during the latter half of the month. In the Ohio river, at Pittsburg, Pennsylvania, navigation was suspended on account of low water on the 5th; and Professor Berner, at Vevay, Indiana, reports that the river opposite that place reached a stage so low, on the 19th, as to render navigation dangerous.

Navigation in the Cumberland, at Nashville, was suspended on account of low water on the 25th.

The Arkansas river, at Fort Smith, rose rapidly on the 5th, 6th, and 7th, and on the last-named date it reached its highest stage, having risen 10.7 feet since the 4th; after the 7th it fell slowly.

In the following table are shown the danger-points at the various river stations; the highest and lowest stages for July, 1885, with dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, July, 1885.

[Expressed in feet and tenths]

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red river:</i>						
Shreveport, Louisiana.....	29 9	14	22 5	31	15 7	6 8
<i>Arkansas river:</i>						
Fort Smith, Arkansas.....	22 0	7	20 9	31	6 2	14 7
Little Rock, Arkansas.....	23 0	10	20 4	31	8 0	12 4
<i>Missouri river:</i>						
Yankton, Dakota.....	24 0	6, 7, 8	19 2	30, 31	17 8	1 4
Omaha, Nebraska.....	18 0	7, 8	13 4	31	10 6	2 8
Leavenworth, Kansas.....	20 0	8, 9	13 8	22	13 1	2 7
<i>Mississippi river:</i>						
Saint Paul, Minnesota.....	14 5	1	5 9	17	4 2	1 7
La Crosse, Wisconsin.....	24 0	30	9 3	21, 22	5 9	3 4
Dubuque, Iowa.....	16 0	1, 2	8 9	25	6 4	2 5
Davenport, Iowa.....	15 0	6, 7, 8	6 5	28	4 7	1 8
Keokuk, Iowa.....	14 0	10	7 2	21, 22, 23	5 2	2 0
Saint Louis, Missouri.....	32 0	1	22 5	22	16 0	6 5
Cairo, Illinois.....	40 0	1	26 8	28	15 5	11 3
Memphis, Tennessee.....	34 0	1	22 0	30	10 4	11 6
Vicksburg, Mississippi.....	41 0	4, 5	33 7	31	19 8	13 9
New Orleans, Louisiana.....	—3 0	7	—4 5	31	—8 4	3 9
<i>Ohio river:</i>						
Pittsburg, Pennsylvania.....	22 0	27	6 0	13	0 6	5 4
Cincinnati, Ohio.....	50 0	1, 2	10 0	18, 19	4 8	5 2
Louisville, Kentucky.....	25 0	1	5 9	21, 22	3 2	2 7
<i>Cumberland river:</i>						
Nashville, Tennessee.....	40 0	3	6 6	26	2 0	4 6
<i>Tennessee river:</i>						
Chattanooga, Tennessee.....	33 0	1	5 5	21, 25, 26	2 8	2 7
<i>Monongahela river:</i>						
Pittsburg, Pennsylvania.....	29 0	27	6 0	13	0 6	5 4
<i>Savannah river:</i>						
Augusta, Georgia.....	32 0	30	7 9	30	5 5	2 4
<i>Mobile river:</i>						
Mobile, Alabama.....	.....	1	18 3	6	15 0	3 3
<i>Sacramento river:</i>						
Red Bluff, California.....	.....	1	0 9	18 to 31	0 5	0 4
Sacramento, California.....	.....	1 to 5	9 0	28 to 31	7 8	1 2
<i>Willamette river:</i>						
Portland, Oregon.....	.....	1	13 6	31	6 4	7 2
<i>Colorado river:</i>						
Yuma, Arizona.....	.....	.....	.....	.....	.....	.....

* Below high-water mark of 1874 and 1883.

HIGH TIDES.

New River Inlet, North Carolina, 16th, 17th.
Cedar Keys, Florida, 12th, 13th, 14th.

LOW TIDES.

Indianola, Texas, 20th, 28th.

FLOODS.

Parsons, Labette county, Kansas: during the night of the 1-2d all creeks and ravines in this region were much swollen. The washing away of bridges caused an almost entire suspension of railroad traffic. The Labette lowlands were submerged, compelling the people to abandon their homes. Considerable damage was done to crops, especially to small grain which was nearly ready for harvest.

Neosha Falls, Woodson county, Kansas: nearly all of the eastern part of the town was inundated on the 3d. In the lowlands in this vicinity the crops were entirely destroyed and much stock drowned. All residents in the northern part of the town were compelled to move.

Humboldt, Allen county, Kansas: on the 3d the Neosha river at this place rose three feet higher than ever before known. No trains arrived at Humboldt on the above date.

"The Argus," of July 4, 1885, published at Albany, New York, contained the following:

QUEBEC, PROVINCE OF QUEBEC, July 3. — Recent heavy rains have caused considerable damage to dams and booms on the rivers around Quebec, which will retard lumber sawyers considerably. In addition to this, a large number of logs have been lost. This summer's floods have been the most serious for years.

Fort Collins, Larimer county, Colorado: the heaviest rain of

the season fell on the afternoon of the 9th. The lowlands in this vicinity were flooded, causing considerable damage to the hay crop. A washout occurred on the railroad about one and one-half miles from this place.

Reports from Titusville, Crawford county, Pennsylvania, state that at about 3 p. m. on the afternoon of the 13th a "cloud-burst" occurred on the hills to the south of that place. It is stated that the water rushed down the hills in vast sheets, carrying away barns, fences and bridges, and washing up large trees. A second "cloud-burst" is also reported as having occurred later on the same day.

Bangor, Maine: on the 2d the Penobscot river reached the highest stage known for many years at this season.

Rio Grande City, Texas: the Rio Grande river began to rise at 6 p. m. on the 1st; during the following night it rose rapidly and overflowed, inundating the lowlands south of the city. The damage caused by this overflow was slight, as the crops in the submerged area were destroyed by the floods which occurred in May. The river fell rapidly on the 3d.

Lamar, Missouri: the very heavy rains of the 3d and 4th caused the streams in this vicinity to overflow, resulting in the washing away of many bridges and culverts. Trains on all railroads in this part of the state were delayed.

Denver, Colorado: during the afternoon of the 26th a "cloud-burst" occurred at a place known as the "Divide," about forty miles south of here. It caused a destructive freshet in Cherry creek, which runs through Denver. At 5.30 p. m. the creek, as is usual at this season, was entirely dry, but at 6 p. m. it was so swollen as to overflow, causing great damage to property. Numerous bridges and a number of houses along the banks of the creek were washed away. This freshet was the most destructive that has occurred here since 1878.

Concerning a remarkable "cloud-burst" which occurred in Colorado during the evening of the 25th, and which proved so destructive at Colorado Springs, the following information has been obtained through "The Daily Gazette," published at that place:

During the evening unusually dark and threatening clouds gathered around the city; from 7 p. m. until midnight heavy showers of rain occurred at intervals, and at times the clouds were brilliantly illuminated by continuous lightning. The wind blew with considerable force, and seemed to come from all quarters. Shortly before 10 p. m. the flood reached Colorado Springs, washing away a dwelling and some out-buildings. The water rushed upon the northern part of the town with such suddenness that the two occupants of the dwelling which was washed away had not time to escape before the building was swept from its foundation.

The following remarks, by Professor Strieby, concerning the "cloud-burst" are also from "The Daily Gazette," before referred to:

It is now possible to trace the course of the devastating flood of Saturday night from its small beginning on the Merriam ranch, through Templeton's Gap, across the long even slopes north of town and through the city. The line of its passage is marked by heaps of rubbish, banks of sand, round cannon-ball shaped masses and wreckage of fences.

The conditions of rapid and extensive precipitation were all present in this storm. The warm moisture-laden air of the day encountered the chill blasts of the upper strata and torrents of rain, accompanied by incredible quantities of hail, were precipitated upon every thing beneath.

The area covered by the storm was probably quite extensive, but that portion of it to which Colorado Springs is indebted for its visitation is comparatively limited.

The old Merriam ranch, east of Templeton's Gap, is a large basin-like depression of some two thousand or more acres content, the natural drainage of which is through the gap. Within this space the rainfall was evidently remarkable, and unmelted hail was still to be seen there up to Monday evening. The contour of that whole area is such as to offer no rapid escape for the accumulating waters. The deep layer of hail and the stiff wiry grass long held in check the increasing volume of waters until they burst their bonds, and then from all points of the inclosure the swelling streams began to make their way to the natural outlet. As brook was added to brook and creek to creek the turbid waters approached the focal point near the herders' huts and became a mighty river ever increasing in volume by the streams from every rocky hill-side and cañon.

This muddy, icy river rushed through Templeton's Gap with a violence that tore its banks, uprooted trees, and levelled obstructing fences. It may be of interest to note the volume of water which deluged our city. Just after the stream emerged from the gap, at a point favorable for measurement, the banks

being steep on both sides and the bottom nearly level, its width, as shown by the lines of debris on the slopes, was about one hundred and seventy-five feet and for the greater part of that distance the depth was approximately seven feet. This gives a section of over a thousand square feet, and the velocity of its discharge must have been frightful over the steep incline of its bed. To the immense volume now in motion there was added all the mass of rain and hail that fell on the area this side of the gap.

In its course through the gap the flood tore large masses of the tenacious black clay from the banks, and the current, with resistless power, propelled them down the stream, turning them over and over, abrading the edges at every bound, until they were converted into balls and cylinders, and these nodules rolling in the gravel gained a rough, stony coating, making them seem like rock-hewn cannon shot. In many places above the town these curious masses, ranging in size from a barrel to an apple, gave to the ground the look of an old battle field strewn with shot. These clay nodules when imbedded in sand and hardened by lapse of time have in other places caused great speculation, and brought out many deep theories respecting their origin. An opportunity is here offered to our people to catch nature in the act of storing them in the newest strata.

Passing out of the gap the angry current entered the Roberts ranch and soon after, encountering rising ground, was divided; one portion, and that by far the larger one, passed on in the direction of the ranch house, threatening to sweep it from its foundations, but soon it was again divided, and only a part approached the house. The house occupied higher ground and was left untouched, but the owner remarked, with feeling, that he wished his corral and garden had been put higher up too. This main stream made a sharp bend below the Roberts house, and now turned southwestward and began to spread out over the flat surface until, when near the city limits, it reached to within a block of Cascade avenue. No water from Templeton's Gap passed westward as far as this avenue. A slight ridge, almost imperceptible to the casual observer, runs from a point a short distance west of Colonel Ensign's house to the fair ground west of the windmill, and owing to the diversion of the waters by this rise Tejon street and Nevada avenue escaped the impending danger.

The stream which branched off at the ranch house made its way southward and finally joined the main stream we have just followed, north of Colonel Ensign's house. At the eastern edge of the Roberts' ranch where the stream first divided, vast numbers of the clay nodules were left stranded in the slack water. We have now to follow this first separated portion of the divided river. It passed in a southwestward direction close to the road leading to Templeton's Gap, and spreading out became nearly a thousand feet wide a little way above the city limits. Again rising ground caused the waters to part; a large portion passing to the south and east, entered Shook's run, where it is crossed by the main irrigation ditch, and thus relieved the flooded streets of a vast volume of hail and water; the other branch made its way onward until it joined the main stream just above the Hooper House. Now, all the divided forces of the flood united were gathered for the final onslaught upon the town. The direction of its course was such as to cause its central current to pass close to the Hooper House and directly for the fatal spot upon which stood Mr. Eaton's residence.

The spreading out of the waters over the very extensive area north of the town must have greatly retarded the rapid progress of the flood and caused the flow through the town to be comparatively slow, and hence much less destructive than it would have been had it been confined to a narrow channel.

The flood which filled the Monument bed was probably due to similar conditions upon areas other than those above described. Large stretches north and northeast of the fair grounds empty their quotas into it.

The observer on the summit of Pike's Peak, Colorado, notes the following in his daily journal:

On the morning of the 26th Colorado Springs appeared as though the town had been visited by a "water-spout" or "cloud-burst." Upon closer examination with the telescope there were observed, about two miles to the northeast of the city, great banks of sleet, from which were flowing large streams of water; immense pools of water appeared in all the principal streets of the city and the first floors of many dwellings were wholly under water.

Baltimore, Maryland: a heavy rainfall occurred in this city on the afternoon of the 26th. In the lower part of the north-western section of the city about thirty houses were flooded; in some instances the water covering the first floors.

Reading, Pennsylvania: during the storm on the night of the 26-27th, two dams at Flying Hill Park gave way, and resulted in the loss of bridges, fences, etc.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for July, 1885, with the telegraphic reports for the succeeding thirty-two hours, shows the general average percentage of verifications to be 84.62 per cent. The percentages for the four elements are: Weather, 83.63; direction of the wind, 84.89; temperature, 85.43; barometer, 82.78 per cent. By geographical districts, they are: For New England, 74.22; middle At-

lantic states, 83.87; south Atlantic states, 85.93; eastern Gulf states, 89.75; western Gulf states, 87.86; lower lake region, 80.16; upper lake region, 84.16; Ohio valley and Tennessee, 84.41; upper Mississippi valley, 83.39; Missouri valley, 79.54; north Pacific coast region, 88.45; middle Pacific coast region, 92.11; south Pacific coast region, 95.47. There were four omissions to predict, out of 3,352, or 0.12 per cent. Of the 3,348 predictions that have been made, eighty-nine, or 2.66 per cent., are considered to have entirely failed; one hundred and fifty-nine, or 4.75 per cent., were one-fourth verified; three hundred and eighty-two, or 11.42 per cent., were one-half verified; four hundred and sixty, or 13.76 per cent., were three-fourths verified; 2,254, or 67.41 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

Special predictions of the weather and temperature have also been made during the month each day for certain localities. The percentages of verifications of these special predictions as made by this office, and in some cases by the observers, are as follows:

Richmond, Virginia, 90.73; Meadville, Pennsylvania, beginning July 4th, 81.25 (as verified by observer, 72.30); Oil City, Pennsylvania, beginning on the 10th, 82.73 (as verified by observer, 100); Columbus, Ohio, 83.06 (as verified by the Ohio Meteorological Bureau, 82.0); Bucyrus, Ohio, beginning on the 2d, 83.75; Albany, New York, 80.64; Cincinnati, Ohio, 80.64; Buffalo, New York, 81.45; Indianapolis, Indiana, 82.26; Chicago, Illinois, 70.16; Saint Louis, Missouri, 74.19; Cairo, Illinois, beginning on the 26th, 83.33; Boston, Massachusetts, and New Haven, Connecticut, 79.03 (as verified by observer, 58.06); Louisville, Kentucky, 75.40; Detroit, Michigan, 79.84; Toledo, Ohio, 77.42; Milwaukee, Wisconsin, 65.32; Jacksonville, Florida, 66.13; Rochester and Oswego, New York, beginning on the 29th, 66.67; Auburn, Alabama, 95.50; Kansas, Indian Territory and western Missouri, 82.26; central Illinois and western Indiana, beginning on the 4th, 78.54; northwestern Ohio and eastern Indiana, beginning on the 4th, 83.48; Omaha, 65.74; Arkansas, 75.46; Georgia, 88.36; Washington, District of Columbia, and Baltimore, Maryland, 80.42; Colorado (for sixteen days), 75.00; New York and Philadelphia, 76.21; Tennessee, beginning on the 4th, 86.46; and Dallas, Texas, beginning on the 18th, 85.42 per cent (as verified by observer, 73.33).

NOTE.—The official "Indications" issued by the Signal Service, beginning with the month of July, 1885, are for a period of thirty-two hours, instead of twenty-four hours, as heretofore.

CAUTIONARY SIGNALS.

During July, 1885, sixty-four cautionary signals were ordered. Of these, thirty-eight, or 59.37 per cent., were justified by winds of twenty-five miles or more per hour, at or within one hundred miles of the station. Eleven cautionary off-shore signals were ordered, of which number, ten, or 91.11 per cent., were justified as to direction, but none were justified as to velocity. These do not include signals ordered at display stations where the velocity of the wind is only estimated. Two signals were ordered late. In thirty eight cases winds of twenty-five miles or more per hour were reported for which no signals were ordered.

RAILWAY WEATHER SIGNALS.

Prof. P. H. Mell, jr., director of the "Alabama Weather Service," in his report for July, states:

The verification of prediction for the whole area was 98 per cent. for temperature and 93 per cent. for weather.

The following roads comprise this system: Western, of Alabama; South and North; Montgomery and Mobile; Mobile and Girard; Georgia Pacific; East Tennessee, Virginia and Georgia; Memphis and Charleston; Columbus Western; Atlanta and West Point, of Georgia; Northeastern, of Georgia.

The July, 1885, report of the "Ohio Meteorological Bureau," under direction of Prof. B. F. Thomas, contains the following:

The verification of railway signals for the month was: for temperature, 91 per cent.; for weather, 73 per cent.

Table of miscellaneous meteorological data for July, 1885—Signal Service observations.

Stations.	Elevation above sea-level.	Atmospheric pressure (in inches and hundredths).				Temperature of the air (in degrees Fahrenheit).												Winds.													
		Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes.	Monthly range of barometer.	Monthly mean.	Departure from normal.	Extremes.		Monthly range.	Daily ranges.		Mean rel. humidity.	Precipitation.	Departure from normal.	Total movement.	Prevailing direction.	Max. velocity.	Direction.	Date.	No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.						
									Highest barometer.	Lowest barometer.		Max.	Min.													Greatest.	Least.				
New England.																															
Eastport.....	61	29.86	+0.04	29.93	30.24	29.55	10.0.69	61.6	+1.2	77.6	16.69.9	49.0	53.5	28.6	27.6	16	7.8	21.79.3	54.6	1.99	-3.13	2,931	s.	20	e.	13	9	5	12	14	
Portland.....	99	29.83	+0.05	29.93	30.22	29.60	10.0.62	67.6	-1.9	86.9	25.70.2	53.7	159.7	33.2	28.1	8	5.7	6.78.5	50.0	5.63	+1.93	4,627	s.	24	s.	9	13	6	17	8	
Mount Washington.....	6,279	23.89	.....	29.96	30.21	23	29.60	1.0.62	48.3	69.4	9.54.9	35.5	114.3	7.33.9	23.1	27	5.5	25.89.2	44.9	11.34	+0.44	20,500	nw.	96	w.	17	20	1	20	10
Boston.....	125	29.82	+0.03	29.94	30.22	29.60	1.0.62	71.3	-0.1	92.8	21.80.3	51.4	163.4	41.4	24.0	17	8.1	14.69.8	60.1	1.44	-2.49	5,911	w.	34	sw.	9	8	3	15	13	
Point Judith.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	80.6	8.74.2	53.0	159.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Block Island.....	27	29.94	.....	29.96	30.22	29.68	1.0.54	70.6	+2.1	87.8	18.77.0	55.3	164.3	32.5	20.0	18	5.7	14.83.5	65.2	0.86	-2.96	7,612	sw.	29	sw.	2	5	2	21	8
Narragansett Pier.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	92.0	18.80.1	48.0	260.2	54.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
New Haven.....	107	29.86	.....	29.96	30.22	29.70	1.0.52	72.1	-0.5	93.5	21.81.3	50.3	263.4	43.2	24.5	2	5.0	14.73.0	62.2	2.51	-2.43	4,127	s.	22	w.	21	6	2	18	11
New London.....	47	29.94	+0.05	29.98	30.24	29.69	1.0.55	71.4	-0.2	92.4	18.79.5	53.0	264.4	39.4	21.2	18	6.0	14.78.4	63.9	2.67	-1.87	4,085	s.	23	sw.	2	8	3	13	15	
Middle Atlantic states.																															
Albany.....	83	29.88	+0.03	29.96	30.23	29.70	14.0.52	73.0	-0.6	96.6	17.83.6	49.8	262.6	46.8	33.4	23	7.7	14.63.6	58.8	1.08	-2.55	4,724	sw.	36	nw.	9	8	3	20	8	
New York City.....	164	29.81	+0.02	29.97	30.20	29.71	14.0.49	74.2	-0.7	95.9	21.83.5	50.2	167.4	39.7	23.7	9	9.8	24.74.0	64.6	3.94	-1.54	5,224	s.	34	n.	9	7	2	18	11	
Philadelphia.....	117	29.85	.....	29.96	30.19	29.72	14.0.47	77.2	-1.2	97.0	18.87.8	56.9	167.8	40.1	24.4	5	11.8	27.65.0	63.4	2.39	-1.96	6,219	sw.	33	sw.	9	10	0	20	11
Atlantic City.....	12	29.95	.....	29.95	30.20	29.65	14.0.55	73.3	-1.0	99.9	10.80.4	56.8	167.7	34.1	23.9	15	5.3	27.87.0	69.0	4.45	+1.30	5,650	s.	25	sw.	37	6	1	21	9
Barnegat City.....	22	29.95	+0.01	29.96	30.20	29.70	14.0.50	73.7	-1.5	92.2	21.80.0	56.0	168.7	35.0	20.0	10	4.4	12.82.8	67.8	1.90	-2.14	8,437	se.	32	s.	14	7	1	14	16	
Cape May.....	27	29.94	.....	29.95	30.14	29.68	14.0.46	74.1	-1.0	88.5	10.80.5	61.0	168.8	42.7	18.3	10	7.0	27.85.2	69.2	1.57	-1.81	7,482	s.	40	e.	26	5	3	18	10
Little Egg Harbor.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	89.7	18.81.5	56.8	167.0	32.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sandy Hook.....	28	29.95	+0.03	29.97	30.22	29.71	14.0.51	73.7	-0.4	96.7	26.83.8	58.4	167.0	38.3	24.1	26	8.6	14.77.2	65.5	3.54	-0.84	8,422	s.	46	n.	9	9	1	21	9	
Cape Henlopen.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	98.7	17.84.4	54.5	166.9	43.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Baltimore.....	45	29.93	-0.01	29.96	30.18	29.70	14.0.48	79.6	+1.3	98.7	21.88.8	56.0	171.8	42.7	23.7	20	6.3	27.63.3	65.1	2.67	-1.77	3,740	se.	24	sw.	26	10	5	20	6	
Ocean City.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	60.5	16.84.3	54.1	169.4	33.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washington City.....	106	29.88	.....	29.97	30.17	29.71	14.0.46	77.8	0.0	99.1	18.87.9	54.1	168.8	45.0	26.8	18	5.7	27.68.8	66.6	3.93	-1.39	3,182	s.	24	sw.	19	9	2	16	13
Cape Henry.....	16	29.98	.....	29.98	30.20	29.72	14.0.48	78.4	+0.5	95.8	18.87.6	60.5	171.1	35.3	23.0	18	9.4	11.77.3	69.9	2.19	-3.38	7,344	sw.	32	nw.	1	10	4	9	18
Chincoteague.....	8	29.97	.....	29.96	30.17	29.72	14.0.50	76.4	+2.0	93.9	18.84.8	68.5	170.1	35.0	24.5	10	6.3	11.81.4	69.6	3.28	-0.73	5,055	s.	24	s.	1	10	4	9	18
Lynchburg.....	652	29.32	+0.01	29.98	30.18	29.74	14.0.44	77.7	-1.1	97.0	22.87.8	54.4	167.6	42.6	27.0	4	9.5	13.70.5	66.3	4.26	+1.20	1,992	s.	22	nw.	29	10	7	9	15	
Norfolk.....	30	29.96	-0.01	29.97	30.18	29.73	14.0.46	80.5	+1.0	98.8	9.90.5	59.4	272.5	39.4	26.8	7	9.2	11.71.6	69.3	3.22	+2.29	4,597	sw.	19	n.	10	13	3	14	14	
South Atlantic states.																															
Cape Lookout.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	94.0	20.87.8	60.0	171.4	34.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Charlotte.....	808	29.19	+0.01	29.99	30.19	29.76	13.0.43	78.2	-1.1	95.0	22.87.1	56.1	170.2	38.9	22.9	3	8.8	12.72.5	67.8	6.31	-0.54	2,286	sw.	18	se.	30	10	6	15	10	
Fort Macon.....	11	30.02	+0.01	30.00	30.22	29.73	14.0.49	79.8	+1.2	87.5	23.84.2	63.6	175.4	23.9	14.2	3	4.0	58.9	67.0	5.31	-1.39	9,730	sw.	36	sw.	11	9	0	16	15	
Hatteras.....	12	30.01	+0.01	30.00	30.22	29.73	14.0.50	78.3	0.0	87.0	7.83.7	60.8	173.9	26.2	16.8	2	7.2	12.83.9	77.2	3.80	-2.84	5,831	sw.	23	n.	30	8	0	17	14	
Kitty Hawk.....	9	30.01	.....	30.00	30.23	29.71	14.0.52	80.3	+1.8	97.7	10.89.7	60.4	173.0	37.2	27.7	10	4.8	12.77.4	72.0	0.94	-6.25	8,147	sw.	28	sw.	10	6	0	15	16
New River Inlet.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Portsmouth.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	89.7	28.84.4	63.0	273.8	26.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Scott's Hill.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Smithville.....	34	30.00	+0.01	30.01	30.20	29.75	14.0.45	80.6	-0.4	89.9	27.86.3	60.2	173.6	29.7	23.7	3	7.1	5.82.1	74.4	2.31	-3.56	7,885	sw.	26	se.	17	11	4	21	6	
Wash Woods.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wilmington.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Charleston.....	52	29.98	+0.01	30.00	30.19	29.77	14.0.42	81.9	-0.9	94.5	31.89.1	66.0	175.7	28.5	18.7	3	6.0	19.78.9	74.0	7.49	-0.14	3,975	sw.	18	sw.	21	13	8	18	4	
Augusta.....	183	29.85	-0.01	30.00	30.21	29.77	14.0.45	80.7	-1.4	101.4	30.93.5	61.7	171.7	34.9	29.1	3	12.8	12.72.0	69.3	3.69	-0.74	2,256	s.	23	s.	11	7	4	19	8	
Savannah.....	87	29.96	+0.01	30.01	30.20	29.77	14.0.43	82.5	-0.4	95.2	31.90.1	65.4	175.4	39.8	21.2	31	10.5	12.72.3	72.2	7.88	-3.02	4,450	s.	28	sw.	28	13	4	19	8	
Jacksonville.....	43	30.01	.....	30.02	30.20	29.78	14.0.40	82.4	-0.3	94.8	7.91.3	60.7	147.5	34.2	21.0	12	10.8	1.75	173.3	7.16	-1.91	4,811	sw.	36	sw.	17	16	4	20	6
Florida peninsula.																															
Cedar Keys.....	22	30.02	-0.03	30.00	30.18	29.78	14.0.40	82.1	-0.6	91.8	1.87.5	71.0	30.76	5.30	8.16	1	6.0	28	79.1	74.8	9.17	+0.69	4,571	sw.	23	s.	14	16	12	17	2
Key West.....	20	30.07	+0.01	30.04	30.16	29.76	14.0.37	84.9	-0.8	93.5	31.91.4	73.3	97.9	5.20	2.17	5	6.2	1.72	74.3	74.8	3.15	-0.98	5,103	se.	24	se.	9	13	3	26	2
Sanford.....	25	30.05	.....	30.04	30.15	29.87	14.0.38	79.5	-2.9	94.7	28.97.1	70.0	117.4	5.24	7.23	6	10.7	15.82.0	73.8	5.52	+1.16	2,971	sw.	23	nw.	7	18	1	20	10
Eastern Gulf states.																															
Atlanta.....	1,129	29																													

Table of miscellaneous meteorological data for July, 1885—Signal Service observations—Continued.

Stations.	Elevation above sea-level.	Atmospheric pressure (in inches and hundredths).				Temperature of the air (in degrees Fahrenheit).										Precipitation.	Winds.				No. of rainy days.	No. of cloudy days.	No. of fair days.								
		Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes.		Monthly mean.	Monthly range of barometer.	Departure from normal.	Extremes.		Monthly range.	Daily ranges.		Mean rel. humidity.		Mean dew-point.	Departure from normal.	Total movement.	Prevailing direction.				Max. velocity.							
					Highest barometer.	Lowest barometer.				Max.	Min.		Greatest.	Least.										Miles per hour.	Direction.	Date.	No. of rainy days.	No. of cloudy days.	No. of fair days.		
Extreme northwest.																															
Moorhead.....	923	28.90	-.05	29.86	30.16	29.35	16.0.82	68.0	+1.6	91.7	29.79.9	42.6	17.57.9	49.1	31.3	2	14.8	14.8	1.61.5	3.34	-1.36	6,466	s.	51	n.	29	12	7	19	5	
Saint Vincent.....	804	29.02	-.05	29.87	30.15	29.32	16.0.82	63.4	0.0	91.1	29.74.4	39.2	17.54.2	51.9	30.7	21	10.0	5.87	5.59.4	3.82	+1.34	5,340	s.	32	n.	10	13	7	17	7	
Bismarck.....	1,994	28.12	-.03	29.85	30.14	29.40	15.0.74	68.0	-0.6	97.4	29.80.6	43.8	17.58.9	53.6	33.4	13	10.0	6.60	4.55.9	2.41	+0.06	2,884	n.	30	n.w.	6	7	7	10	8	
Fort Buford.....	1,930	27.89	-.04	29.86	30.15	29.40	15.0.75	68.1	+1.3	96.0	14.82.8	45.7	9.52.4	50.3	39.7	15	16.8	24.68	0.55.3	3.02	+0.53	0,093	w.	50	w.	6	9	10	14	1	
Fort Totten.....	1,500	28.29	.....	29.84	30.10	31.29.40	10.0.70	65.3	.....	93.2	28.77.5	42.0	17.56.5	50.6	32.4	28	12.3	5.77	8.57.8	5.83	.....	6,904	n.w.	53	n.e.	28	13	3	18	7
Upper Mississippi valley.																															
Saint Paul.....	831	29.03	-.04	29.89	30.18	29.52	16.0.65	72.5	+0.9	94.7	30.84.1	55.0	17.63.7	39.7	29.0	30	9.0	20.82	5.66.5	5.86	+2.66	4,492	s.	29	n.w.	8	12	9	15	7	
La Crosse.....	725	29.13	-.04	29.88	30.14	29.55	16.0.60	74.0	+0.8	92.0	30.82.5	55.7	16.06.0	36.3	34.3	14	7.3	22.74	5.55.1	5.51	+1.34	4,438	s.	44	n.	29	16	5	20	6	
Davenport.....	615	29.31	-.03	29.93	30.17	29.71	15.0.46	75.5	+0.5	97.4	30.85.5	55.1	16.06.1	42.3	39.7	12	12.8	25.70	0.64.1	1.66	-2.27	5,573	s.w.	44	s.w.	8	10	7	16	6	
Des Moines.....	849	29.07	-.03	29.93	30.18	29.68	15.0.51	75.9	+2.4	100.1	30.88.5	54.2	17.66.7	45.9	32.0	3	12.6	25.74	8.66.6	6.55	+2.55	3,501	s.w.	30	s.w.	8	16	13	13	5	
Dubuque.....	665	29.25	.....	29.91	30.16	29.66	15.0.49	73.8	-0.4	97.1	30.84.6	51.8	16.4.3	45.3	30.3	14	13.4	9.74	6.64.4	6.35	+1.05	3,137	s.	24	n.w.	25	15	9	15	7
Keokuk.....	618	29.31	-.02	29.93	30.18	29.70	15.0.48	78.5	+1.1	99.0	30.87.9	58.0	16.09.3	41.0	26.0	12	12.0	17.72	4.68.4	2.39	-2.38	4,833	s.w.	36	s.	16	7	4	14	13	
Calmar.....	359	29.04	.....	29.99	30.14	29.85	15.0.29	80.0	+0.5	95.8	30.87.6	62.1	17.72.9	33.7	20.0	7	7.0	11.74	9.70.7	0.82	-3.45	3,849	s.	32	s.w.	5	8	3	21	7
Springfield.....	644	29.30	-.03	29.93	30.13	29.75	15.0.39	78.1	+1.9	96.2	30.87.3	53.0	16.09.3	43.2	24.6	7	11.3	17.07	0.05.6	1.82	-0.84	3,522	s.w.	25	s.w.	9	9	5	18	8	
Saint Louis.....	571	29.39	-.08	29.96	30.14	29.77	15.0.37	80.5	+1.8	96.6	30.89.3	60.0	17.4.1	35.6	21.6	31	10.0	17.75	3.71.4	2.58	-1.67	5,119	s.w.	32	s.	7	10	2	21	8	
Missouri valley.																															
Lamar.....	1,028	28.91	.....	29.97	30.14	29.80	15.0.34	76.8	.....	92.0	30.88.0	58.0	16.09.3	41.0	25.1	15	10.4	2.78	2.68.6	7.75	.....	6,077	s.	26	n.e.	14	12	7	9	15
Leavenworth.....	842	29.09	-.03	29.93	30.13	29.70	15.0.43	77.9	0.0	98.0	30.88.5	59.0	16.08.8	39.0	26.4	14	11.0	10.75	5.68.9	4.50	-0.56	4,315	s.	26	n.w.	4	12	4	15	12	
Omaha.....	1,113	28.81	-.03	29.93	30.18	29.61	15.0.58	77.0	+0.9	97.8	19.87.2	55.2	17.68.3	42.6	29.7	17	6.3	10.74	5.67.6	9.24	+3.29	5,527	s.	36	n.	30	14	7	14	10	
Fort Bennett.....	1,510	28.34	.....	29.88	30.16	29.38	15.0.78	73.7	+2.9	102.1	28.97.4	45.5	17.63.4	56.6	43.2	17	8.2	1.03	2.59.0	1.55	-0.78	6,590	s.	44	n.w.	16	9	4	18	9
Fort Sully.....	1,305	28.54	-.05	29.86	30.13	29.42	15.0.71	71.7	+3.3	98.2	28.96.8	44.7	17.61.0	8.53.8	.....	.....	.....	.....	.....	2.71	+0.24	.....	.....	.....	.....	.....	.....	.....	.....	.....
Huron.....	1,328	28.54	-.05	29.90	30.18	29.46	15.0.73	73.1	-0.3	100.7	29.85.0	47.8	17.63.8	52.9	28.9	13	7.6	10.76	2.84.3	1.97	-2.17	3,496	s.	39	n.w.	26	12	2	20	9	
Northern slope.																															
Fort Assinaboine.....	2,720	27.16	+0.1	29.91	30.13	29.68	15.0.47	65.5	-0.7	96.0	14.79.7	41.3	9.53.5	54.7	35.9	14	12.2	8.58	2.48.3	1.56	-2.12	7,174	w.	41	n.w.	10	8	6	13	12	
Fort Benton.....	2,681	27.33	.....	29.94	30.17	29.74	14.0.43	66.9	-2.4	103.2	30.83.2	44.3	17.54.1	58.4	30.7	14	12.5	8.60	3.50.5	2.82	+1.01	4,176	s.w.	40	s.w.	7	10	7	13	11
Fort Custer.....	3,040	26.84	+0.2	29.86	30.08	29.47	15.0.60	70.0	0.0	100.0	29.87.6	44.2	16.55.0	55.8	34.3	15	12.7	25.55	0.51.8	0.85	-0.36	7,004	e.	37	w.	3	9	4	20	7	
Fort Maginnis.....	4,340	25.60	.....	29.91	30.12	29.61	15.0.50	62.5	+1.0	92.1	30.76.6	44.2	15.51.6	47.9	30.1	12	9.4	8.65	3.50.4	0.88	+0.42	7,203	d.	42	n.w.	15	13	8	15	8
Fort Shaw.....	3,550	26.36	.....	29.98	30.09	29.64	14.0.46	64.1	+0.9	93.8	29.77.8	44.1	9.50.9	49.5	34.2	7	14.1	5.25	66.1	4.1	+1.08	3,962	w.	38	w.	7	16	7	8	16
Helena.....	4,044	25.85	-.03	29.86	30.02	29.59	15.0.46	64.7	-1.9	92.3	29.77.4	44.5	15.53.0	47.8	36.8	7	5.7	8.55	3.47.1	1.16	-0.19	4,510	s.w.	25	s.w.	1	7	1	14	13	
Poplar River.....	2,030	27.78	.....	29.85	30.16	29.56	15.0.68	66.6	.....	94.8	14.82.1	42.3	9.53.2	52.5	39.6	14	19.4	16.75	1.57.6	3.05	+1.66	4,013	w.	60	w.	16	2	2	9	10
Deadwood.....	4,600	25.44	+0.1	29.77	30.06	29.54	15.0.53	65.5	+1.6	90.8	29.76.8	45.0	17.55.8	45.0	32.2	13	9.7	9.60	4.18.2	1.44	-1.06	3,402	n.e.	18	s.w.	18	15	1	15	15	
Cheyenne.....	6,105	24.11	-.02	29.81	29.96	29.59	15.0.37	65.7	-1.3	88.2	7.80.8	48.5	24.53.3	39.7	37.1	14	10.7	9.59	4.48.6	1.92	+0.21	6,571	n.w.	47	n.e.	4	14	1	17	13	
North Platte.....	2,841	27.09	-.01	29.87	30.15	29.43	15.0.71	72.3	-1.3	97.6	15.83.8	48.0	6.03.3	49.6	34.3	7	4.9	1.75	6.03.0	3.13	-0.16	5,778	n.e.	33	e.	25	13	5	22	4	
Middle slope.																															
Denver.....	5,394	24.84	+0.2	29.84	29.98	29.59	15.0.39	70.3	-1.9	97.3	15.85.6	50.3	5.58.6	47.0	40.8	7	13.1	16.53	5.49.8	1.33	-0.46	5,077	s.	44	w.	4	15	3	19	9	
Pike's Peak.....	14,134	18.14	.....	29.90	30.02	29.70	15.0.36	39.4	-0.5	97.0	15.47.0	34.2	5.34.0	32.8	20.0	17	5.1	23.79	0.32.9	2.67	-1.86	9,523	w.	36	w.	10	5	0	17	9
West Las Animas.....	3,890	26.07	+0.1	29.80	29.93	29.56	15.0.37	75.1	-0.0	105.2	15.90.9	51.8	6.02.5	53.4	42.1	7	14.6	10.63	5.59.8	2.71	+1.34	3,334	e.	30	n.w.	19	8	0	13	18	
Concordia.....	1,384	28.49	.....	29.88	30.12	29.57	15.0.54	74.6	.....	94.0	14.85.0	52.3	1.05.9	41.7	28.4	7	7.8	5.81	3.67.8	4.90	-0.60	6,110	s.	29	s.w.	4	9	8	13	10
Dodge City.....	2,517	27.40	-.01	29.86	30.01	29.62	15.0.49	76.3	-1.0	97.3	15.87.0	56.6	6.07.1	40.7	30.9	6	9.2	11.72	3.65.5	0.31	+2.63	8,698	s.e.	35	s.e.	1	9	2	15	14	
Fort Reno.....	98.0	13.92.1	62.0	14.70.2	34.0	1.80	-1.89
Fort Supply.....	90.0	29.90.6	4.17	-3.37
Fort Elliott.....
Southern slope.																															
Fort Sill.....	1,200	28.74	-.03	29.90	30.05	29.74	15.0.32	80.8	-0.5	100.0	29.94.0	62.5	20.68.2	37.5	53.5	5	20.9	15.72	3.69.5	1.39	-1.85	5,906	s.e.	30	n.e.	14	2	2	6	23	
Fort Concho.....	1,920	28.10	.....	29.95	30.12	29.78	15.0.34	82.1	-0.4	107.0	15.98.1	61.9	6.70.5	54.3	13.5	20	19.3	3.65	1.67.0	1.59	-2.11	6,356	s.	45	n.	5	4	0	13	18
Fort Davis.....	4,928	25.24</																													

ATMOSPHERIC ELECTRICITY.

AURORAS.

2d.—Tatoosh Island, Washington Territory: a brilliant aurora was observed from 3 to 5 a. m.; it consisted of a white light rising about 15° above the horizon.

5th.—Bismarck, Dakota: a faint aurora appeared at 11.30 p. m. covering 120° of the northern horizon and extending to an altitude of 30° with occasional slender beams shooting up to 45°; the display was obscured by clouds at 1 a. m. of the 6th.

5th.—Webster, Dakota.

12th.—Eastport, Maine: an auroral arch of about 10° altitude was observed from 8 to 11 p. m. At 10.20 p. m. a beam one degree in width extended from the northeastern horizon to an altitude of 45°.

12th.—Cambridge, Massachusetts: suspected at 10.15 p. m.

13th.—Yates Centre, Kansas: an aurora was observed at 11.25 p. m. consisting of three faint radiating beams extending to an altitude of 30°; at 11.40 p. m. a faint bar formed above the others at an altitude of 40°.

15th.—Vevay, Indiana: from 2 to 2.30 a. m., of moderate brilliancy.

16th.—Vevay, Indiana.

17th.—Manistique, Michigan: from 9 p. m. until midnight.

18th.—Vevay, Indiana: from 11 p. m. until 2 a. m. of the 19th.

21st.—Vevay, Indiana: bright crimson aurora at 2.30 a. m.

22d.—Eastport, Maine: well-defined auroral arch from 9 to 10 p. m.; extending from northeast to northwest and to an altitude of 20°.

24th.—Indianapolis, Indiana: at 12.15 a. m. an auroral light was observed along the northern horizon from east to west, reaching an altitude of 40°; at 12.40 the light was but faintly visible.

27th.—Des Moines (near), Iowa: very bright aurora in the morning.

30th.—Harvard, Nebraska.

31st.—Webster, Dakota: during the evening streamers were observed reaching nearly half way to the zenith.

THUNDER-STORMS.

Thunder-storms are reported to have occurred in the various states and territories on the following dates:

Alabama.—4th, 5th, 7th, 8th, 10th to 13th, 16th, 17th, 19th, 21st, 24th to 28th, 30th, 31st.

Arizona.—8th, 9th, 12th to 23d, 27th to 31st.

Arkansas.—2d to 5th, 9th to 14th, 16th, 17th, 20th to 23d, 25th to 29th, 31st.

California.—3d, 7th, 26th, 27th.

Colorado.—1st to 4th, 7th to 10th, 12th, 13th, 15th to 23d, 25th to 31st.

Connecticut.—3d, 4th, 5th, 7th, 8th, 9th, 21st, 25th, 29th, 31st.

Dakota.—2d to 5th, 7th, 8th, 11th to 31st.

Delaware.—24th, 26th.

District of Columbia.—9th, 10th, 18th, 19th, 21st, 25th, 26th, 31st.

Florida.—Daily.

Georgia.—4th to 15th, 18th to 21st, 23d to 31st.

Idaho.—1st, 2d, 7th, 8th, 9th, 24th, 25th, 30th.

Illinois.—5th to 10th, 12th to 19th, 21st to 31st.

Indiana.—3d, 4th, 5th, 7th to 10th, 13th, 15th, 18th, 19th, 21st to 26th, 28th to 31st.

Indian Territory.—5th, 9th, 10th, 13th, 14th, 20th, 22d, 28th.

Iowa.—1st, 3d to 9th, 12th to 31st.

Kansas.—1st to 7th, 9th to 17th, 21st to 31st.

Kentucky.—9th, 18th, 22d, 23d, 26th, 30th.

Louisiana.—2d, 4th to 8th, 10th to 14th, 16th, 18th to 31st.

Maine.—5th, 6th, 9th, 10th, 21st, 22d, 25th, 29th, 31st.

Maryland.—2d, 5th, 9th, 10th, 18th, 19th, 21st, 24th, 25th, 26th, 31st.

Massachusetts.—2d to 6th, 8th, 9th, 10th, 14th, 21st, 25th, 26th, 28th, 29th, 31st.

Michigan.—6th to 9th, 12th to 16th, 18th, 19th, 20th, 23d, 24th, 26th to 30th.

Minnesota.—3d to 8th, 11th, 12th, 13th, 15th, 16th, 18th, 19th, 20th, 22d, 24th, 26th to 30th.

Mississippi.—1st to 5th, 7th, 10th, 12th, 14th, 16th, 17th, 19th, 21st, 22d, 26th to 31st.

Missouri.—2d, 4th, 5th, 9th, 13th, 17th, 21st, 22d, 25th, 26th, 30th, 31st.

Montana.—1st, 2d, 3d, 5th, 7th to 10th, 14th to 17th, 19th, 24th to 27th, 30th, 31st.

Nebraska.—1st, 3d, 4th, 5th, 7th to 10th, 12th, 14th to 18th, 20th to 23d, 25th to 31st.

Nevada.—1st, 7th, 23d, 24th.

New Hampshire.—4th, 6th, 7th, 9th, 29th, 31st.

New Jersey.—2d, 4th to 10th, 14th, 18th, 20th, 21st, 24th to 27th, 29th, 31st.

New Mexico.—2d, 3d, 6th, 9th, 10th, 13th, 16th, 17th, 18th, 21st to 28th, 30th.

New York.—4th to 10th, 13th to 17th, 20th, 21st, 23d to 26th, 28th, 29th.

North Carolina.—4th, 5th, 6th, 9th to 14th, 17th, 18th, 19th, 21st to 30th.

Ohio.—1st, 6th, 8th, 9th, 11th, 13th, 15th, 16th, 18th to 26th, 28th to 31st.

Oregon.—2d, 3d, 26th to 30th.

Pennsylvania.—1st, 4th to 10th, 13th, 14th, 20th to 26th, 29th, 31st.

Rhode Island.—3d, 9th, 10th, 14th, 21st, 25th, 26th, 31st.

South Carolina.—4th to 8th, 11th to 17th, 19th, 20th, 21st, 23d to 31st.

Tennessee.—3d to 6th, 9th to 14th, 16th, 18th to 31st.

Texas.—1st to 8th, 10th, 11th, 12th, 14th to 31st.

Utah.—7th, 9th, 14th, 15th, 16th, 21st, 23d, 27th.

Vermont.—3d, 5th, 6th, 9th, 10th, 14th, 24th, 25th, 29th, 30th, 31st.

Virginia.—2d, 4th, 5th, 10th, 11th, 17th to 20th, 22d to 27th, 29th, 30th, 31st.

Washington Territory.—1st, 7th to 10th, 27th, 30th, 31st.

West Virginia.—14th, 22d, 23d, 24th, 26th.

Wisconsin.—1st, 3d, 5th to 9th, 12th, 13th, 14th, 16th, 18th to 25th, 27th to 31st.

Wyoming.—1st, 2d, 8th, 9th, 18th, 20th, 23d, 26th.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos were observed in the various states and territories as follows:

Arizona.—3d, 9th.

Arkansas.—3d, 4th, 10th, 13th, 31st.

California.—6th, 9th, 18th.

Dakota.—24th.

Florida.—28th, 31st.

Illinois.—2d, 12th, 14th, 27th.

Indiana.—2d, 7th, 9th, 12th, 16th, 17th, 27th, 28th.

Iowa.—7th, 8th, 13th, 15th, 17th, 20th, 28th, 31st.

Kansas.—11th, 31st.

Louisiana.—22d.

Maine.—5th, 17th.

Massachusetts.—13th.

Michigan.—8th, 12th, 19th.

Minnesota.—3d, 19th.

Nebraska.—12th, 17th, 19th, 27th, 28th, 29th.

New Jersey.—5th.

New York.—5th, 6th, 13th, 15th, 23d.

Ohio.—8th, 9th, 10th, 12th, 13th, 25th.

Oregon.—1st, 2d, 16th.

Tennessee.—1st, 2d, 24th, 26th, 27th.

Virginia.—2d, 10th, 11th.

Wisconsin.—18th.

Wyoming.—3d, 4th, 27th, 28th.

LUNAR HALOS.

Lunar halos were observed in the various states and territories on the following dates:

Arkansas.—23d, 24th, 27th.
 Colorado.—3d, 22d.
 Dakota.—24th, 26th.
 District of Columbia.—3d.
 Florida.—19th, 21st, 24th to 28th.
 Georgia.—19th, 27th, 29th.
 Illinois.—23d, 26th, 27th, 29th, 31st.
 Indiana.—15th, 16th, 17th, 20th, 26th to 29th.
 Iowa.—21st, 22d, 24th, 26th, 27th, 29th.
 Kansas.—12th, 15th, 21st, 25th, 26th.
 Louisiana.—19th, 22d, 24th.
 Maine.—20th.
 Maryland.—22d, 23d, 24th, 30th.
 Massachusetts.—17th.
 Michigan.—19th, 22d, 24th.
 Minnesota.—24th.
 Montana.—22d, 25th.
 Nebraska.—10th, 18th, 22d, 28th, 29th.
 New York.—21st, 22d.
 North Carolina.—22d, 26th.
 Ohio.—16th, 19th, 20th, 21st, 23d.
 Pennsylvania.—21st, 25th.
 South Carolina.—23d.
 Tennessee.—19th, 24th, 26th, 27th.
 Texas.—1st, 21st to 24th, 26th.
 Virginia.—6th, 7th, 15th, 16th, 17th, 19th to 25th, 29th, 30th.
 Wisconsin.—20th, 24th.

The phases of the moon during July were: last quarter, 5th, 7.20 a. m.; new moon, 12th, 12.10 a. m.; first quarter, 18th, 7.14 p. m.; full moon, 26th, 9.17 p. m.; perigee, 11th, 8.24 p. m.; apogee, 25th, 4.18 a. m.

MIRAGE.

Mirage was observed at the following stations during the month:

Salina, Kansas, 5th, 7th, 10th, 13th.
 Northfield, Minnesota, 19th, 28th, 29th.
 Rock Academy, Caswell county, North Carolina, 22d, 27th.
 Oswego, New York, 27th: the islands near Kingston and foot of lake, ordinarily not visible, were plainly seen.

MISCELLANEOUS PHENOMENA.

SUN SPOTS.

Prof. David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for July, 1885:

Date— July, 1885.	No. of new.		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
8, 9 a. m.	0	5†	0	5†	0	5†	5	65†	
9, 11 a. m.	0	5†	0	5†	0	5†	5	65†	
10, 2 p. m.	1	5†	1	10†	0	9	5	60†	
11, 7 a. m.	2	5†	0	25†	1	3	7	40†	
12, 4 p. m.	2	30†	2	15†	2	30†	7	60†	
13, 5 p. m.	1	40†	1	20†	1	20†	7	105†	
16, 4 p. m.	2	10†	0	0	0	0	9	110†	
19, 5 p. m.	1	1	0	0	0	0	8	110†	
20, 7 p. m.	1	1	0	0	0	0	7	85†	
22, 4 p. m.	0	10†	0	0	0	0	6	115†	
23, 5 p. m.	0	0	0	0	0	0	5	65†	
27, 11 a. m.	1	15†	0	0	1	15†	4	55†	
29, 5 p. m.	0	0	0	0	0	0	3	35†	
30, 4 p. m.	1	1	0	0	0	0	3	25†	
31, 4 p. m.	1	10†	0	0	0	0	4	35†	

Faculae were seen at the time of every observation.

† Approximated.

Prof. L. G. Carpenter, of the Michigan State Agricultural College, Lansing, reports sun spots during July as follows:

3d, 1.10 p. m., seven groups, seventy-three spots; 4th, 10.15 a. m., eight groups, thirty-three spots; 6th, 1.10 p. m., six groups, twenty-four spots; 7th, 1.30 p. m., five groups, forty spots; 11th, 12.30 p. m., four groups, twenty-spots; 16th, 4.15 p. m., three groups, seventy spots; 20th, 5.30 p. m., seven

groups, fifty-four spots; 23d, — p. m., five groups, forty-five spots; 25th, 5 p. m., two groups, eighteen spots (hazy); 27th, 3 p. m., four groups, forty-three spots; 31st, 4.30 p. m., four groups, twenty-nine spots.

Mr. H. D. Govey, at North Lewisburg, Champaign county, Ohio, reports sun spots on the following dates: 1st, 3d, 4th, 6th, 7th, 8th, 10th, 11th, 12th, 14th, 16th, 18th, 20th, 22d, 24th, 27th, 28th, 29th, 31st. The spots were numerous and large about the middle of the month.

SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and sixty-one stations show 4,912 observations to have been made, of which ten were reported doubtful; of the remainder, 4,902, there were 4,103, or 83.7 per cent., followed by the expected weather.

The observer at Cedar Keys, Florida, reports a beautiful and very brilliant red glow, extending to the zenith, at sunset on the 23d.

The following is taken from "The Morning Oregonian," of July 4th, published at Portland, Oregon:

The western sky was colored a bright roseate hue last evening, and all around the horizon and up to the zenith the clouds were fringed with red—a repetition of the "red sunsets" of last summer, which were the subject of so much discussion. This is the first time the phenomenon has been seen in any degree of magnitude this season. About 9 o'clock it was very brilliant and attracted general attention.

DROUGHT.

Arkansas.—Lead Hill, Boone county: although very heavy rains fell during the first half of the month, during the latter half, dry weather prevailed. At the close of the month corn and cotton were suffering for rain.

California.—Cape Mendocino: no rain fell here during July, although precipitation in the form of fog, to the amount of 0.32 inch, was collected in the Signal Service rain-gauge. Pastures have become parched and streams have dried up.

Indiana.—Vevay, Switzerland county: from the 13th to 22d vegetation suffered for rain; on the last-named date a heavy rainfall occurred.

Sunman, Ripley county: the month has been unusually warm and dry.

Kansas.—Elk Falls, Elk county: very dry weather prevailed from the 1st to 29th.

Maud, Kingman county: but little rain fell during the latter part of the month, and vegetation suffered in consequence.

Louisiana.—Grand Coteau, Saint Landry parish, 31st: the corn crop in this vicinity has been injured by drought.

Massachusetts.—Amherst, Hampshire county: at the close of the month a severe drought prevailed; but 0.20 inch of rain fell from the 14th to 31st.

Westborough, Worcester county: the month was hot and dry; the monthly rainfall, 1.56 inches, was the smallest for many years.

Dudley, Worcester county: the month was very dry; the total rainfall amounted to but 1.26 inches.

Mississippi.—Natchez, 12th: although numerous rains have fallen in this vicinity, on many plantations in this (Adams) county there has been no rain for several weeks.

New Jersey.—Vineland, Cumberland county: drought prevailed during the month, causing serious injury to crops.

New York.—Humphrey, Cattaraugus county: very dry weather prevailed at the close of the month; springs and wells were failing.

North Carolina.—Kitty Hawk, 22d: drought has caused injury to crops in this vicinity.

Portsmouth, 9th: vegetation in this vicinity is suffering seriously from drought.

Oregon.—East Portland: very hot and dry weather prevailed in this region throughout the month.

Ashland, 23d: very warm and dry weather prevails in this region; rain is much needed.

Pennsylvania.—Dyberry, Wayne county: the monthly rainfall was only 1.70 inches; crops in this region suffered from drought; streams began to fail, and in some instances completely dried up.

Ashland, Schuylkill county: the protracted drought of July seriously injured the crops; a heavy rain fell on August 1st, but it came too late to be of much benefit.

Wysox, Bradford county, 30th: farmers in this region report unusually dry weather.

Quakertown, Bucks county, 30th: drought prevailed in this section during the month; much inconvenience has been experienced on account of scarcity of water.

Catawissa, Columbia county, 30th: the excessive heat during the latter part of the month caused much injury to vegetation.

Texas.—Indianola, 28th: farmers in the surrounding country state that crops are suffering from drought.

Utah.—Nephi, Juab county: the month of July was the driest for several years; only 0.02 inch of rain fell.

Virginia.—Lancaster, Lancaster county, 30th: the tobacco crop in this county has been seriously injured by drought.

Washington Territory.—Bainbridge Island: July was an unusually dry month.

Wenas, Yakima county, 8th: the excessively warm and dry weather, now prevailing, is causing serious injury to crops.

EARTHQUAKES.

Santa Barbara, Santa Barbara county, California, 9th: five earthquake shocks occurred between 1.20 and 8.15 a. m., each one of long duration and sufficient severity to awaken the greater number of the inhabitants.

Princeton, Colusa county, California: a slight shock of earthquake was felt here at 10.15 p. m. of the 16th.

Chico, Butte county, California: a sharp shock of earthquake occurred at 10.15 p. m. on the 16th. Windows rattled, and people were awakened from sleep. It had been blowing a gale all day previous. No damage is reported.

Centreville, Alameda county, California, 23d: a sharp shock of earthquake was felt here to-day at 12.20 p. m. The movement seemed to be from north to south. No damage was done. A slight shock was also noticed last evening at about 7 p. m.

San José, Santa Clara county, California, 23d: a sharp shock of earthquake, preceded by a rumbling noise, was experienced here at 12.25 this afternoon. The oscillation was from west to east and the duration about three seconds; clocks were stopped, and some little damage resulted to fragile wares in stores.

The following is an extract from "Science" of August 21, 1885:

On Tuesday morning, July 14th, an earthquake occurred in eastern and central Bengal, which, according to "Nature," is said to have been the severest one experienced by the inhabitants for forty years. The shocks lasted for nearly a minute. In Calcutta the houses rocked and cracked, and the plaster fell in large quantities. There was general consternation, the people all rushing out of doors. A wave was raised in the river, like a bore, causing some anxiety with respect to the shipping. Luckily no accident occurred and no damage was done beyond the cracking of the walls of some old houses; but had the shocks lasted some seconds longer the city would probably have been laid in ruins. Some of the up-country stations were less fortunate. At Serajunge, a chimney belonging to some jute mills fell. In many other places some of the houses fell and people were killed. Twenty-five deaths are reported to have occurred at Aheripore, five at Bogara, eleven at Azimgunge, and seven at Dacca. The following morning another shock was felt at Cashmere, which did some injury. According to the latest reports the earthquake caused altogether seventy deaths at Bengal.

FOREST AND PRAIRIE FIRES.

The following is taken from the "New York Herald" of July 11th and 12th, respectively:

PHILADELPHIA, PENNSYLVANIA, July 10.—A fire started yesterday in the great cranberry belt of Burlington county, New Jersey, swept over hundreds of acres of valuable bog, and is still burning. The continued drought made the grass and vines very inflammable, and the fire spread with lightning-like rapidity. It spread to the west Jersey meadows, containing thousands of acres of grass and cranberries, thousands of dollars worth of the latter fruit, nearly ripe for market, being destroyed. A two-story dwelling, occupied by Joseph

Ware, was burned to the ground, the occupants merely escaping with their lives. An unoccupied house on the Raleigh estate was also burned.

The fire is now travelling toward other bogs at Braddock's Mills, and the people are fighting it with back fires.

PHILADELPHIA, PENNSYLVANIA, July 11.—The fires among the Jersey cranberry bogs, near Atco, on the Burlington county border, are still burning, and threaten to destroy vast tracts of valuable grass and bog land and cedar swamp. All the inhabitants of the vicinity are fighting the flames by building back fires and digging ditches. The dense smoke fills the villages north of Atsion, on the New Jersey Southern railroad, and it is feared that the flames will spread in that direction. The fires can only be extinguished by a heavy rainfall, as the bogs are honey-combed with fire.

Moorestown, New Jersey, 12th: heavy forest fires to the southeast; smoke dense for several days.

The following appeared in the "Buffalo (New York) Express" of July 25th:

CAMDEN NEW JERSEY, July 24.—The Jersey forest fires are now assuming most alarming proportions, and unless a heavy rain soon quenches the flames they will accomplish the destruction of a number of towns and small settlements among the pines of Camden, Burlington, and Atlantic counties. They have never before burned so fiercely, and not since 1838 has the country been so dry and favorable for the spread of the flames.

Yesterday the towns of Atco, Jackson, Sloantown, Waterford, Pestletown, Winslow, Weekstown, Hammonton, Atsion, and a number of other small places in Camden and Burlington counties near the Camden and Atlantic railroad, were surrounded by brush and wood fire, and all the inhabitants were out fighting the flames. Large tracts of cedar timber and several dwellings have already been burned, and many of those fighting the flames have had narrow escapes.

A great cloud of smoke hangs over the burning district, and the country is lighted for miles around at night by the fires. The people are entirely worn out with watching and fighting the flames, and are praying for rain.

Quakertown, Pennsylvania, 22d: fires broke out along the railroad and burned off several grass fields, causing a smoky atmosphere.

The following is taken from the "New York Herald" of July 26th:

CAMDEN, NEW JERSEY, July 25th.—The flames are still sweeping through the timber and bog lands of south Jersey, and a great and despairing cry for rain is going up from the people, who have been fighting the fires for the past two weeks. Should the wind change to the south or southwest nothing can save the villages of Atco and Jackson from destruction.

Late yesterday the fires reached the Maple Island district and came rapidly westward toward the New Jersey Southern railroad. A great effort was made to keep the flames from crossing the railroad track, and all the able-bodied men of Atco and Jackson, recruited with two car loads of section hands sent by the railroad company, ranged themselves along the track, at intervals, for eight miles, to fight the fast advancing flames. They were finally successful in confining the fire to the eastern side of the road, although several thousand railroad ties, piled alongside the track, were destroyed. Word was received at Atco last night that the cranberry bogs of E. Z. Collings, of Camden, and the saw-mill of Elias Russell, near Brooklyn, had been destroyed. The fires in that section are now confined to the big swamp, where they are burning much valuable cedar timber.

Forest and prairie fires were also reported from the following places:

Brownsville, Texas, 18th, north of station.

East Portland, Oregon, 25th to 28th.

INSECTS.

The following is taken from the "New York Herald" of July 11th:

LYONS, NEW YORK, July 10.—The Hessian fly is destroying hundreds of fields of growing wheat in this vicinity. More extensive ravages in grain have never before been known in Wayne and Ontario counties. Hessian flies appeared in the towns of Lyons and Arcadia a month ago, but nothing was done to check their increase. They have now extended many miles in all directions and are moving rapidly toward the northern part of Wayne county. The total amount of destruction of wheat thus far is estimated at over one hundred and eighty thousand bushels. In Lyons, Junius, and Arcadia wheat fields of twenty-five and thirty acres each have been so injured that they appear wholly barren, where three weeks ago a harvest of thousands of bushels was promised. In Junius the devastation has been so complete that farmers there are about to burn the whole of the wheat straw on their lands in order to check, if possible, the advance of the pest. Many farmers have lost so much grain that they will be unable to make payments on the mortgages on their property, and will probably have their farms sold by the sheriff. The greatest fear is that the pest will rapidly destroy the grain until harvest, and that hundreds more of fields will be ruined.

The following is also taken from the "New York Herald" of July 12th:

EAGLE PASS, TEXAS, July 11.—As the north-bound train to-day on the Mexican extension of the Southern Pacific road approached La Aura, in the State of Coahuila, it passed under an enormous cloud of grasshoppers that were flying westward. So dense was the cloud that for half an hour the sunlight was obscured. The train stopped and passengers gathered specimens, which prove to be of the Kansas variety. But few of the grasshoppers alighted near the train. The cloud appeared to be about fifteen miles in length by two miles wide.

Old Mexicans say no such numbers of grasshoppers have been seen in Coahuila in fifty years. La Aura is one hundred and twenty miles south of Eagle Pass. People throughout the entire states of Coahuila and Chihuahua are terror stricken at prospects of famine before them.

North Lewisburg, Ohio, 12th: locusts have about all disappeared.

Port Huron, Michigan, 17th: large swarms of "fish flies" have made their appearance in this city.

Saint Paul, Minnesota, 17th: reports from Fort Buford, Dakota, state that grasshoppers had made their appearance in the vicinity of that place and were devastating the growing crops.

Harvard, Nebraska, 31st: chinch-bugs appeared early in July and did some damage to wheat and corn.

Fort Madison, Iowa, 31st: the grasshoppers are proving destructive to the crops.

Toledo, Ohio, 31st: it is reported that grasshoppers are very numerous in the Maumee valley, and are causing much injury to crops.

The Signal Service observer at Red Bluff, California, reports that locusts had entirely disappeared in that vicinity by the 25th.

METEORS.

Of the meteors observed during the month, the one of the 17th deserves especial mention. It appeared about 9 p. m., and by its unusual brilliancy attracted the attention of many persons at different places throughout several states.

The following are some of the descriptions received in regard to this meteor:

Albany, New York: about 9 p. m. a brilliant meteor was observed to shoot across the sky from east to west, passing south of the zenith. Its apparent size was about two-thirds that of the full moon. Its flight was from two to three seconds duration and it disappeared, after exploding.

Buffalo, New York: a beautiful meteor was observed at 9.05 p. m., being of a pale blue or whitish color which changed to red. It passed from a point two or three degrees east of north, followed by two explosions in quick succession.

Rochester, New York: a brilliant meteor was observed at 9 p. m., leaving a bright trail; it exploded at an altitude of about thirty-five degrees, lighting up the sky with great brilliancy.

Menand station (near Albany), New York: at 9 p. m. a bright flash of light was noticed, suffusing the whole eastern sky like a brilliant flash of heat lightning; it is supposed to have been the reflection caused by a large meteor.

Mountainville, New York: at 9.05 p. m. a brilliant meteor passed from the zenith toward the west, followed by a flash of light like the explosion of a rocket, only more intense.

Le Roy, New York: a meteor was observed at 9.10 p. m., which exploded without noise.

Ithaca, New York: a brilliant meteor was observed, having an apparent diameter much larger than the moon's. Its path was visible from near the North star towards the horizon, where it was obscured by clouds. The path of light that marked its course was fan shaped, exhibiting a brilliant variegation of colors. Large particles were cast off, causing a beautiful shower of different colored fire-balls. The light in intensity was similar to a bright flash of lightning, though of many seconds duration, and was observed by persons sitting near lamps and away from windows.

Factoryville, New York: at 9.03 p. m. a large meteor appeared in the northwestern sky about thirty degrees above the horizon, lasting about fifteen seconds, when it burst and dropped to the earth with showers of sparks and streamers of

beautiful colors. When it exploded the light was so bright that it dazzled the eye.

Syracuse, New York: about 9 p. m. a huge fire-ball or meteor was seen to pass over the city at lightning speed, taking a course from south to southwest. The heavens were brilliantly illuminated, the light exceeding in brightness the most dazzling electric light. About ten minutes after the disappearance of the meteor a strange, low, rumbling sound was heard, which was thought by many to be an earthquake.

Poughkeepsie, New York: about 9 p. m. a brilliant meteor passed over this city from northeast to northwest. It presented various colors, emitting sparks as it passed along, and was heard to explode with a loud noise.

Utica, New York: at 9 p. m., a little north of the zenith, a meteor shot apparently toward the western horizon, increasing in brilliancy as it went. At an elevation of about thirty-five degrees an explosion occurred; no report was audible at this place.

Niagara Falls, Ontario: at 9 p. m. a brilliant meteor was seen dropping suddenly from the heavens and leaving a bright shining tail of fire behind it, apparently forty feet long. The meteor resembled a huge, bright, silver ball, shooting distinct sparks in front of it.

Wellsborough, Pennsylvania: at about 9 p. m. an unusually large meteor flashed across the horizon in a course from east-northeast to west. In passing it emitted a bluish white light of remarkable intensity and brilliancy, followed by a train from twelve to fifteen degrees in length. No report was heard.

Troy, Pennsylvania: about 9 p. m. a very bright meteor passed from the zenith toward the northwest; it was visible for a few seconds.

Wilkesbarre, Pennsylvania: a brilliant meteor was observed, which was remarkable for its size and splendor.

Cape Henlopen, Delaware: a brilliant meteor shot across the eastern sky at 9 p. m.

Beverly, New Jersey: a large meteor fell a little west of north, casting shadows equal to those made by the full moon, and appearing nearly four to six inches in diameter. It displayed a bluish green color, which changed to yellow before it disappeared.

Somerville, New Jersey: a brilliant meteor was seen at about 9.30 p. m. in the north, moving to the west. As it seemed to touch the horizon in the northwest it exploded, displaying a bright light; no detonation was heard.

Bethel, Connecticut: at 9 p. m. a large and bright meteor appeared in the northwestern sky, resembling a ball of fire and illuminating the entire heavens.

Fall River, Massachusetts: a bright meteor of unusual size was observed in the west, at first appearing white, then yellow and green, and finally bursting into several pieces. When first seen it was apparently about the size of a coconut.

At the following places a meteor was also observed on the 17th:

Cooperstown, Palermo, Penn Yan, Oswego, Watertown, and Schenectady, New York; Fallsington and Quakertown, Pennsylvania, and Amherst, Massachusetts.

Other meteors were observed at the following places on the dates set opposite:

Terre Haute, Indiana, 1st, 6th.
Le Roy, New York, 6th.
Beloit and Sussex, Wisconsin, 7th.
Crete, Nebraska, 10th.
North Stamford, Connecticut, 11th.
Pensacola, Florida, 11th.
Salina, Kansas, 12th.
Davenport, Iowa, 12th, 18th, 28th, 31st.
Cleburne, Texas, 14th, 18th, 23d.
Vevay, Indiana, 15th, 21st.
Dover, New Jersey, 15th, 20th, 30th.
Cape Henlopen, Delaware, 16th.
Pittsburg, Pennsylvania, 16th.
Point Pleasant, Louisiana, 18th.

Stockham, Nebraska, 18th.
 New Haven, Connecticut, 19th.
 Jacksonborough, Ohio, 19th.
 Anna, Illinois, 19th.
 Rochester, Minnesota, 19th.
 Ithaca, New York, 20th.
 Archer, Florida, 20th.
 Wausau, Wisconsin, 24th.
 Vermillion, Dakota, 25th.
 Wytheville, Virginia, 28th, 30th.
 Logansport, Indiana, 29th, 31st.
 Toledo, Ohio, 30th.
 Clay Centre, Kansas, 31st.
 Madison, Nebraska, 31st.
 Wentworth, Dakota, 31st.

POLAR BANDS.

Archer, Florida, 16th.
 Brownsville, Texas, 31st.
 Dale Enterprise, Virginia, 9th, 11th.
 Escanaba, Michigan, 25th.
 Fort Bridger, Wyoming, 27th, 28th.
 Gardiner, Maine, 13th, 20th, 26th.
 Montrose, Colorado, 3d, 10th, 23d, 24th.
 Prairie du Chien, Wisconsin, 9th.
 Riley, Illinois, 10th, 19th.
 Rio Grande City, Texas, 29th.
 Salina, Kansas, 11th.
 Wauseon, Ohio, 4th, 9th.

SAND STORMS.

Fort Concho, Texas, 5th.
 Frisco, Utah, 17th, 18th, 19th.
 Willcox, Arizona, 30th.
 Point Pleasant, Louisiana, 31st.

WATER-SPOUTS.

The s. s. "British Prince," Captain Nowell, on July 3d, in N. 39° 34', W. 63° 35', saw two water-spouts.
 The bark "Levanter," Capt. A. F. Vesper, on July 16th, in N. 28° 10', W. 87° 15', passed a large water-spout.
 The s. s. "Colorado," James Daniels, master, on July 23d, in N. 27° 0', W. 89° 45', observed (sky cloudless) two whirlwinds moving from west to east at the rate of about thirty miles an hour and raising the water to a height of about thirty feet.
 The s. s. "Craigendoran," Capt. A. G. Allen, on July 30th, at 1.30 a. m., in N. 37° 0', W. 77° 0', saw a large water-spout moving southward.

Meteorological record of voluntary observers and Army post surgeons, July, 1885.
 The maximum and minimum temperatures at stations marked thus (*) are from readings of the ordinary thermometer.

Meteorological record of voluntary observers, etc.—Continued.

Stations.	Temperature.			Rainfall.	Stations.	Temperature.			Rainfall.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
Florida—Continued.	0	0	0	Inches	Minnesota.	0	0	0	Inches
Manatee *.....	92	76	82.3	12.54	Fort Snelling.....	94	52	72.7	5.60
Saint Augustine.....	92	71	80.7	2.87	Minneapolis *.....	94	51	72.6	4.52
Tallahassee *.....	91	74	83	6.55	Northfield.....	92	50	72	5.67
Georgia.					Rochester *.....	100	58	.....	5.62
Milledgeville.....	96	63	80.6	3.04	Montana.				
Illinois.					Fort Assinaboine.....	98	37	67.5	1.88
Anna.....	96	58	79	2.19	Fort Ellis.....	97	34	65.9	3.61
Bunker Hill.....	102	50	79.3	2.29	Fort Keogh.....	104	48	73.1	1.86
Charleston.....	102	46	77	2.83	Fort Shaw.....	95	38	64.3	2.21
Collinsville.....	96	52	74.2	2.37	Nebraska.				
Mattoon *.....	102	58	80	3.80	Crete.....	93	51	73.6	7.25
Peoria.....	104	53	81.1	4.73	De Soto *.....	97	53	75.2	3.55
Marengo.....	92	48	71.8	2.07	Fairbury *.....	102	60	88.3	7.50
Rockford.....	93	44	72.5	4.50	Fort Robinson.....	100	50	73.0	2.66
Sycamore *.....	94	53	71.0	4.98	Frederick *.....	99	55	75.1	3.36
Wilton Centre.....	103	39	74.2	4.70	Geneva (near).....	100	49	75.3	1.39
Indiana.					Harvard *.....	110	50	.....	.....
Fort Wayne.....	98	56	.....	2.76	Madison *.....	95	59	73.2	1.31
Guilford *.....	99	47	77.1	3.25	Marquette *.....	93	50	73.4	4.75
Jeffersonville.....	97	51	75.2	2.44	Stockham *.....	100	70	86.4	4.80
Logansport *.....	102	46	77.6	4.00	Yutan *.....	100	60	75.6	2.90
Lafayette.....	100	55	78.6	1.33	Nevada.				
Mauzy *.....	94	42	73.4	1.50	Carson City.....	100	42	72.3	0.0
Sunman *.....	96	50	79.5	1.30	Fort McDermitt.....	94	47	72.0	0.0
Spiceland.....	96	47	76.1	1.83	New Jersey.				
Vevay.....	99	50	78.4	2.40	Beverly.....	100	60	77.2	2.75
Iowa.					Dover.....	95	44	71.7	4.95
Cedar Rapids.....	96	53	73.9	6.35	Moorestown.....	99	60	74.8	3.08
Cresco *.....	93	57	72.2	5.04	Salem.....	100	65	70.5	1.48
Des Moines (near).....	97	48	73.9	.....	South Orange.....	97	50	73.4	4.00
Manchester.....	99	54	75.6	5.03	Somerville *.....	96	51.3	75.0	7.28
Fort Madison *.....	100	59	.....	2.40	Vineland.....	100	58	78.8	1.29
West Union *.....	93	54	70.5	5.25	New York.				
Guttenberg *.....	96	52	71.2	6.08	Auburn.....	88.5	46	70.4	4.64
Indianola *.....	96	59	78.2	7.00	Cooperstown *.....	85	50	68.3	3.00
Independence *.....	92	59	73.7	4.99	David's Island.....	97	60	73.3	1.87
Monticello.....	102	51	74.4	6.10	Fort Niagara.....	88	48	69.8	2.99
Muscataine *.....	102	49	76.5	5.03	Factoryville.....	93	47	69.8	2.99
Ottumwa *.....	99	59	77.1	4.36	Fort Columbus.....	95	57	74.8	3.17
Kansas.					Houghton Farm.....	98.8	43.5	72.4	2.58
Allison.....	105	58	76.6	4.01	Humphrey.....	90	54	74	2.38
Atchison.....	98	62	78.2	3.77	Ithaca.....	96	46.5	71.3	2.84
Clay Centre *.....	100	60	77.4	6.06	Le Roy.....	96	44	71.3	2.70
Emporia.....	98	57	.....	10.26	Madison Barracks.....	90	44	69.8	2.42
Independence *.....	100	61	78.2	5.02	Menard Station *.....	92	57	72.7	2.52
Lawrence.....	96	56	77.1	6.03	Palermo *.....	90	52	69.6	4.35
Manhattan.....	99	60	77.5	4.99	Plattsburg B'ks.....	91	50	67.5	3.85
Oswego.....	100	60	75.7	8.95	West Point.....	95	50	69.1	4.04
Topeka *.....	100	61	78.5	.....	White Plains *.....	100	50	74.1	3.60
Salina.....	88	62	79.9	7.02	New Mexico.				
Sterling.....	99	63	76.8	6.08	Fort Wingate.....	96	49	70.4	2.28
Sherlock *.....	90	64	77.2	4.71	Fort Union.....	91	48	70.0	2.51
Wellington *.....	102	64	79.6	4.94	Gallinas Spring.....	93	60	.....	1.65
W. Leavenworth *.....	99	61	.....	4.00	Puerto de Luna *.....	99	63	79.0	0.65
Wyandotte *.....	99	60	79.7	4.76	North Carolina.				
Yates Centre.....	99	59	78.2	11.08	Chapel Hill.....	100	61	79.6	3.95
Louisiana.					Flat Rock *.....	87	49	71.1	2.84
Grand Coteau.....	94	69	82.7	5.21	Lincolnton *.....	88	60	71.4	3.77
Luling *.....	94	69	.....	5.94	Raleigh.....	98	63	80.0	2.00
Point Pleasant *.....	90	67	84	4.63	Statesville *.....	93	60	80.4	4.47
Maine.					Weldon *.....	100	62	80.5	3.86
Cornish.....	89	54	67.3	3.64	Ohio.				
Fort Preble.....	86	57	70.0	3.40	Cleveland *.....	91	53	72.9	4.18
Gardiner.....	83	50	67.3	1.73	College Hill.....	103	57	80.5	2.60
Orono *.....	80	54	67.8	4.70	Garrettsville.....	92	43	69.9	5.55
Missouri.					Hiram.....	92	54	93.1	5.37
Carthage.....	50	60	80.8	4.31	Jacksonburg.....	100	52	79.6	3.65
Centerville.....	97	53	.....	5.53	North Lewisburg.....	99	51	75.8	2.45
Conception.....	95	55	76.6	1.75	Portsmouth.....	95	47	75.3	2.12
Independence *.....	92	54	74.6	6.45	Ruggles *.....	94	52	71.3	3.15
Pierce City.....	98	59	78	8.70	Tiffin *.....	95	53	76.5	3.27
Springfield.....	94	59	77.6	9.14	Wauseon.....	98	46	74.4	3.03
Massachusetts.					Westerville.....	95	44	73.2	3.53
Amherst (Agr'l St'n).....	93	41	68.4	2.07	Yellow Springs *.....	98	54	74.2	3.10
Deerfield.....	93.5	42.3	70.5	2.25	Oregon.				
Princeton.....	89.5	46	68.5	4.23	Albany *.....	98	56	68.4	0.0
Rowe *.....	86	48	67.8	4.16	East Portland *.....	96	56	.....	0.04
Somerset.....	104	44	75.5	2.37	Eola *.....	98	62	66.9	0.0
Taunton.....	94	50	71.9	2.56	Pennsylvania.				
Williamstown.....	76.9	42.7	64.8	2.87	Catawissa.....	96	50	.....	3.26
Westborough.....	96	45	75.2	1.56	Dyberry.....	93	40	69.2	1.70
Worcester.....	87	53	68.9	2.10	Easton *.....	101	64	82.5	2.63
Maryland.					Fallington.....	97	59	74.1	4.05
Cumberland.....	95	56	74.5	1.01	Grampan Hills.....	94	52	72.1	6.14
Emmitsburg.....	98	59	70.6	2.10	Mahanoy Plane *.....	97	58	77.5	1.75
Fort McHenry.....	97	60	77.7	2.15	South Bethlehem.....	103	46.4	72.5	3.48
Fallston.....	97	52	74.5	3.33	West Chester.....	98	53	76	0.93
Woodstock.....	98	50	76.2	3.98	Wellsborough *.....	96	54	71.5	3.77
Great Falls.....	100	54	78.4	0.29	Wilkesbarre.....	97.2	42	72.4	3.01
McDonogh.....	93	54	76.3	3.95	Troy.....	90.5	40	70.5	1.80
Michigan.					South Carolina.				
Birmingham.....	90	51	.....	4.49	Pacolet *.....	85	67	78.8	1.22
Buchanan *.....	96	54	76.3	.....	Spartanburg *.....	80	43	.....	.....
Boone.....	95	27	66.9	3.61	Tennessee.				
Fort Brady.....	88	41	65.6	2.61	Ashwood *.....	98	56	77	3.60
Hudson.....	96	47	73.4	4.06	Austin.....	96	52	78.3	4.51
Kalamazoo *.....	91	49	.....	2.28	Milan.....	97	58	78	3.71
Lansing.....	91	47	73.3	2.04	Texas.				
Manistiquie.....	92	41	64.3	1.02	Austin *.....	98	52	84.6	0.05
Thornville.....	94	55	72.9	3.10	Corpus Christi *.....	94	79	.....	.....
Traverse City *.....	92	44	.....	2.30	Cleburne *.....	95	68	81	1.32

Stations.	Temperature.			Rainfall.	Stations.	Temperature.			Rainfall.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
Alabama.	0	0	0	Inches	Colorado.	0	0	0	Inches
Greensborough.....	95	66	75.8	2.51	Bradford.....	85	23	51.9	.....
Mount Vernon B'ks.....	98	59	81.6	4.07	Fort Lyon.....	105	54	74.8	3.45
Arizona.					Pueblo *.....	96	62	74.8	2.83
Fort McDowell.....	114	70	92.9	trace.	Connecticut.				
Tucson.....	.....	.....	.....	1.00	Hartford.....	97	38	72.9	2.10
Arkansas.					North Colebrook *.....	97.5	49	71.2	4.96
Mount Ida.....	95	57	77.6	6.40	Southington *.....	88	56	71.8	2.07
California.					Dakota.				
Alcatraz Island.....	70	48	57.8	0.02	Fort Meade.....	95	53	73	2.28
Angel Island.....	93	49	61	0.02	Fort A. Lincoln.....	99	45	71.2	1.52
Cahuenga Valley.....	.....	.....	.....	0.0	Fort Pembina.....	100	50	72	2.82
College City *.....	108	50	76.4	0.0	Fort Sisseton.....	94	38	65.1	2.51
Fort Mason.....	74	53	60.5	0.0	Fort Sully.....	92	40	69.5	2.79
Fall Brook *.....	101	55	70.1	0.0	Fort Randall.....	104	45	75.8	2.70
Murrieta *.....	105	57	70.9	0.0	Fort Totten.....	107	43	76.5	3.83
Oroville.....	96	60	78.8	0.0	Fort Yates.....	92	41	67.2	5.71
Oakland.....	84	57	63	0.02	Richland *.....	97	38	72.9	2.80
Poway *.....	97	60	70.7	0.0	Webster.....	95	46	68.2	2.50
Princeton.....	101	54	76.6	0.0	Wentworth.....	99	46	74.7	4.97
Sacramento.....	97	54	70.5	trace.	Florida.				
Salinas *.....	73	54	61.4	trace.	Archer.....	91	71	75.2	5.91
Santa Rosa *.....	87	57	70.8	0.0	Limosa.....	95	70	80.9	9.30
San Rafael (near).....	94	41	.....	0.0	Mayport *.....	92	73	80.7	5.07

Meteorological record of voluntary observers, etc.—Continued.

Stations.	Temperature.			Rainfall.	Stations.	Temperature.			Rainfall.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
<i>Texas—Continued.</i>	0	0	0	Inch.	<i>West Virginia.</i>	0	0	0	Inch.
Clarkeville *	95	68	81.7	7.95	Helvetia	96	38	71.2	4.41
Fort Brown	90	71	85	0.13	<i>Washington Territory.</i>				
Fort Concho	106	65	86	1.08	Bainbridge Island *	87	50	65.6	0.82
Huntsville *	94	66	80	2.59	Ellensburg *	86	51	66.4	0.26
New Ulm	95	73	81.5	3.24	Kinowick *	104	52	trace	trace
<i>Utah.</i>					Tacoma *	86	51	66.4	0.26
Nephi *	93	51	72.2	0.03	<i>Wisconsin.</i>				
<i>Vermont.</i>					Madison	90	52	75.2	7.30
Brattleborough	94	42	72.4	2.40	Neillsville *	93	36	65.5	5.65
Burlington	90	49.6	70.8	3.80	Prairie du Chien *	98	55	74.5	6.37
Dorset	88.5	42	65.3	4.35	Wausau	90	42	69.3	4.44
Lunenburg *	85	48	66.2	6.46	Waukesha *	100	51	71.4	5.34
Newport	93	50	69	6.62	Beloit	96	44	73.3	2.99
Strafford	88	52	68.6	4.90	Embarras *	89	56	71.8	10.45
Woodstock	93.4	44	68.7	3.39	Lancaster	96	48	73.5	5.89
<i>Virginia.</i>					Manitowoc *	92	46	67.7	5.57
Accotink *	101	62	80.7	1.78	<i>Wyoming.</i>				
Bird's Nest *	99	67	82.9	4.45	Fort Bridger	90	34	67.7	0.22
Dale Enterprise	100	51	79.9	2.86	Fort Fred Steele	94	40	69.7	0.94
Fort Monroe	95	56	79.9	0.97					
Wytheville	90	43	72.9	1.33					

In the preceding table are given the maximum, minimum, and mean temperatures, and the monthly rainfall at voluntary stations and United States military posts.

With this REVIEW, and in succeeding numbers, all complete and continuous reports that are promptly received will appear in a similar table. The attention of voluntary observers, who forward reports, is invited to the importance of keeping complete and continuous records. Those who find it impracticable to follow the "Instructions for Voluntary Observers," page 92, which provide that the mean daily temperature shall be obtained by dividing the sum of the 7, 2, and twice the 9 o'clock observations by four, can, however, make valuable reports by recording the maximum and minimum, or highest and lowest observed, temperatures daily, and obtain a monthly mean by dividing the sum of all such observations by the number of observations made. It is requested that the kind of instruments used be stated in the summary. It is especially desirable that all observers, who have meteorological records extending back over a period of years, will deduce therefrom normals, particularly of temperature and precipitation, for purpose of comparison. All comparisons of this nature will be published in the REVIEW tables. It is the custom of a number of observers to note these comparisons from month to month, but there are many, having records covering many years of continuous observations, who, by omitting to compare the means of the month for which the report is made with the normal for that month, render reports much less interest than they would otherwise be.

ERRATUM.

In the June, 1885, REVIEW, on page 159, in the table of miscellaneous data, the departure from normal temperature at Helena, Montana, given as $-2^{\circ}.3$ should read $-4^{\circ}.3$.

NOTES AND EXTRACTS.

The following extract is from the July, 1885, report of the "Alabama Weather Service," under direction of Prof. P. H. Mell, jr., Auburn:

The conditions of the weather over the whole state have been very favorable for the growth and maturity of the corn crop, and the rapid development of the cotton plant. Reports from many sections state that the outlook for an abundant yield has not been so promising for many years, and the farmers everywhere are very much encouraged.

The average temperature given this month is exactly the same as that published in the bulletin for July, 1884.

The rainfall was slightly below the average for last year, but the uniform distribution, following the weather conditions of June, produced the results on the farms mentioned above.

Thunder-storms have been of frequent occurrence, and in some portions of the state the display of electricity was brilliant and alarming in its close proximity and rapid succession of flashes. Prattville and Tusculumbia reported some stock killed by lightning. Some of these storms were accompanied with

strong winds that damaged fences, trees, and small buildings, but they were entirely local, and their tracks were very limited in extent.

State summary.

Mean temperature, $80^{\circ}.5$; highest temperature, 103° , at Calera, on the 30th; lowest temperature, 48° , at Gadsden, on the 2d; range of temperature, 55° ; greatest monthly range of temperature, 49° , at Gadsden; least monthly range of temperature, 13° , at La Fayette; mean daily range, $16^{\circ}.6$; greatest daily range of temperature, 40° , at Calera, on the 4th; least daily range of temperature, 1° , at Huntsville, on the 10th, Jacksonville, on the 26th, and Mount View, on the 12th.

Mean depth of rainfall, 4.18 inches; mean daily rainfall, 0.132; greatest depth of monthly rainfall, 8.00 inches, at Prattville; least depth of monthly rainfall, 1.76, at Pine Apple; greatest daily rainfall average for state, 0.39 of an inch, on the 11th; greatest daily local rainfall, 1.75 inches, at Edwardsville, on the 27th.

Average number of days on which rain fell, 13.

Average number of cloudy days, 9; average number of fair days, 15; average number of clear days, 7; warmest days, 30th, 31st; coldest days, 1st, 2d.

Prevailing direction of wind, southwest.

Thunder-storms were general on the 4th, 5th, 6th, 9th, 10th, 11th, 12th, 20th, 22d, 23d, 25th, 26th, 27th.

The following meteorological summary and accompanying remarks are from the July, 1885, report of the "Indiana Weather Service," under direction of Prof. H. A. Huston, of Purdue University, Lafayette:

Districts.	Temperature.			Precipitation.
	Highest.	Lowest.	Monthly mean.	
Northern counties.....	102	40	75.53	1.96
Central counties.....	99	42	75.48	2.40
Southern counties.....	103	50	77.25	2.23
State.....	103	42	76.09	2.19

The mean temperature of the state for July, $76^{\circ}.09$, was $2^{\circ}.53$ above that for last year, $0^{\circ}.51$ below the mean of fourteen years at Indianapolis, $1^{\circ}.51$ below the mean of twenty-six years at Logansport, $2^{\circ}.61$ below the mean of twenty-one years at Vevay, $2^{\circ}.04$ above the mean of four years at Blue Lick, $3^{\circ}.25$ above the mean of four years at Worthington, $3^{\circ}.99$ above the mean of five years at Maury, and $3^{\circ}.49$ above the mean of six years at this station.

The mean precipitation for the state, 2.19 inches, was 2.38 below that for last year, 3.35 below the mean of fourteen years at Indianapolis, 2.09 below the mean of twenty-six years at Logansport, 2.96 below the mean of twenty-one years at Vevay, 1.41 below the mean of four years at Blue Lick, 2.26 below the mean of four years at Worthington, 0.70 below the mean of four years at Maury, and 1.60 below the mean of six years at this station. The rainfall was very unevenly distributed, ranging from 0.40, in Allen county, to 6.31, in Carroll county.

The mean barometer in the state was 30.004 and the monthly range, 0.494.

Wind, total miles for July, Indianapolis, 3,204; Greencastle, 3,060; Lafayette, 4,645. Temperature of water in wells: Blue Lick, well 25 feet deep, 55° ; Lafayette, well 112 feet deep, 52° ; Miami, 58° .

Prof. W. H. Ragan, director of the "Indiana Volunteer Weather Service," furnishes the following meteorological summary for July:

Highest monthly mean temperature, $79^{\circ}.5$, at Sunman; lowest mean, $69^{\circ}.5$, at Danville; highest reading, 102° , at Logansport, on 20th; lowest reading, 42° , at Maury, on 1st. The 20th was the warmest day at most stations, and the 1st the coldest.

The temperature averaged 3° higher in the state than in 1883, and $2^{\circ}.3$ higher than in 1884, and the rainfall 2.27 lower than in 1883, and 2.26 lower than in 1884. The crops do not seem to have suffered greatly for rain, from which it might be deduced that the normal rainfall for this month is nearly twice the amount absolutely required; the amount this year having been but little more than half the normal, and there having been no general excess during June to carry forward. The rainfall was unevenly distributed through the month and over the state, ranging from 10.70, on the 22d, to none on the 1st, 2d, 10th, 12th, 14th, 16th, 19th, 28th, and from 4.80, at Crawfordsville, to 0.40, at Fort Wayne. There was a general wet spell from the 21st to the 26th, during which the great bulk of the rain fell in all sections.

The following is an extract from the July, 1885, report of the "Minnesota Weather Service," under direction of Prof. Wm. W. Payne, Northfield:

The average temperature of July in Minnesota has varied from slightly below the normal in the extreme northwest, to from $0^{\circ}.5$ to $1^{\circ}.3$ above the normal in the central and southern parts of the state. From the 1st to the 19th the temperature was near the average, after which a slight depression in pressure in the British Northwest and Montana induced southerly, moist air currents, and a gradually increasing temperature until the 30th, when the highest temperatures for the month were generally observed. This heated term, accompanied as it was by a high degree of humidity and frequent thun-

der, hail and wind storms, was the cause of widespread and general damage to small grain just at the most critical period of its growth. On the 30th and 31st northerly winds produced a decided fall in temperature and a decrease in humidity, bringing about more favorable conditions for the proper development of the wheat plant, with the prospect of a comparatively abundant yield of small grain for Minnesota and Dakota. The lowest temperatures were on the 1st, in the southeastern, and the 17th, in the northwestern, parts of the state, this during the prevalence of a high area of the barometer in each of the sections above named. 38°.4, at Park Rapids, on the 17th, and 39°.2, at Saint Vincent, on the same date, were reported, but without frost. A marked feature of the month was the high degree of moisture in the air, amounting to from 8 to 15 per cent. above the mean.

Precipitation.—The rainfall for July, was, in general, much above the average, and well distributed. A local drouth prevailed at Mankato, where but 1.11 inches was measured. The large amounts of 8.51, 6.19 and 5.99 inches occurred at La Crosse, Park Rapids, and Red Wing, respectively. Thunderstorms were frequent and destructive. Rainfalls of over one inch in one day: Saint Paul, 1.15, on 19th, and 1.02, on 28th; Duluth, 1.61, on 12th; Saint Vincent, 1.39, on 16th; La Crosse, 1.66, on 8th, 1.00, on 25th, and 3.20 (2 inches of which fell in two hours), on the 29th; Bird Island, 1.05, on the 16th; Northfield, 1.39, on 29th; Red Wing, 2.83, on 22d, and 1.06, on 29th; Park Rapids, 2.83, on 3d, and 1.65, on 29th.

State summary.

Mean temperature, 70°.9; highest temperature, at Sherburne, 93°.0; lowest temperature, at Park Rapids, 38°.4; range of temperature, 60°.6; mean of maximum temperature, 93°.1; mean of minimum temperature, 49°.9.

Highest barometer, Winona, 7th, 30.298; lowest barometer, Saint Vincent, 6th, 29.324; mean barometer, 29.889.

Mean rainfall, in inches, 4.62; greatest rainfall, La Crosse, 8.51; least rainfall, Mankato, 1.11; greatest rainfall in one day, La Crosse, 29th, 3.20.

Mean relative humidity, 77.4 per cent.

Average monthly movement of wind in miles, 4,789; greatest monthly movement of wind in miles (at Bird Island), 7,241; least monthly movement of wind in miles (at Red Wing), 3,299.

The following is an extract from the "Missouri Weather Service," under direction of Prof. Francis E. Nipher, Saint Louis:

The mean temperature at the central station was 1°.8 above the normal for July at Saint Louis. The highest temperatures were observed in the latter decade of the month, the 30th being generally, all over the state, the warmest day of the month. The heat was felt, however, very nearly as much in the first part of the month, on account of the sultry, close state of the atmosphere.

The lowest temperature was pretty generally observed on the first of the month.

The rainfall was heaviest in the southwestern part of the state, the lightest being along the eastern border. At Saint Louis it was considerably below the normal for July, which is 4.16 inches.

In one or two instances hail was observed in different parts of the state.

The following notes are taken from the reports:

Glasgow: 18th to 31st, very hot; wheat crop poor; an abundance of fine hay just up; good crop of oats, prospect for a fine crop of corn; apple crop very poor; blackberries very scarce. Savannah: extremely dry up to 28th; corn, oat, spring-wheat and potato crops fine; a change of 40° in temperature occurred in eighteen hours on the 16th. Graham: weather unusually dry up to the 22d, some corn suffered, the quality of the wheat is better than usual, it being harvested without much rain; hay better than usual in quantity and quality; the only severe storm occurred on the 27th, the rainfall being as much as 1.21 inches in fifteen minutes. Saint Charles: prospects for corn crop very fine; yield of wheat and quality poor; potatoes in abundance. Greenfield: very heavy rainfall on the 3d (3.10 inches), doing damage to wheat in shock and to corn, and to property in some instances; has been an extremely hot month, ranging from 84° to 98° at 14h. Miami: a remarkable rain and wind storm occurred on the 29th. Louisiana: the weather of the last decade of the month has been exceedingly sultry, rendering outdoor exertion, even the least, irksome in the extreme. Houstonia: corn coming out very much; wheat turning out poorly, about one fourth crop; a great deal of hay being put up. Chamois: the normal temperature for this place (taken from twelve years observations) for July is 78°.95, which is 1°.84 below what it was during the past month. The rainfall was 3.78 inches above the normal.

The following is an extract from the July, 1885, report of the "Nebraska Weather Service," under direction of Prof. Goodwin D. Swezey, of Doane College, Crete:

The temperature has been about normal but with extremes of heat and cold, the highest temperatures reported exceeding those of the past seven Julys, except in 1882 and 1883, and the lowest being lower than any except 1884.

Rainfall has been quite unequally distributed, the northeast section of the state receiving nearly double the southwest, but on the whole it was above the normal. About the usual number of hail and thunder-storms have occurred; fogs have been uncommonly rare. While the record of decidedly clear days has been normal, the number of decidedly cloudy days has been unusually great. The average rain for the different sections of the state for July, 1885, is as follows: northeast section, 5.28 inches; southeast section, 6.54; northwest section, 5.69; southwest section, 3.58. Greatest number of days of appreciable precipitation, 15, at Stockham.

Beginning with July, arrangements have been made for the display of "cold-wave flags"—white flag with black centre—at Omaha and at Crete, the prediction being telegraphed from Washington, usually from twenty-four to twenty-eight hours in advance; during the fall and spring these timely warnings may save many dollars worth of perishable property to those in sight of these flags. Anyone may receive these warnings by paying the cost of the telegram from Omaha. It is hoped that a good number of our observers may provide and display flags in this way. Advice as to expense may be had of the director.

The following is an extract from the July, 1885, report of the "Ohio Meteorological Bureau," under direction of Prof. B. F. Thomas, of the Ohio State University, Columbus:

An examination of the monthly reports show that July, 1885, did not differ materially from that of the two preceding years, except in temperature.

The mean atmospheric pressure, 29.975 inches, was .008 of an inch above the average of the past three years. The maximum pressure, 30.28 inches, was .03 of an inch below that of 1883, and .01 above that of 1884, while the minimum, 29.61 inches, was .04 below that of 1883, and .04 above that of 1884.

The month was not characterized by any sudden changes in the barometer.

The mean temperature for the month, 75°.2, is only 0°.7 above what may be considered as the normal, but it is 2°.3 above the mean of the past three years. The mean of the first half of the month was very low for July, but the unprecedented high temperatures of the last half of the month brought the monthly mean above the normal. The maximum temperature for the month, 101°.0, was recorded on the 21st, at the Ohio State University; this is 2° higher than the highest reported since the organization of the Bureau; the highest reported heretofore was 99°.0, on October 1, 1884, at Ironton. The following stations report a maximum temperature for July in excess of that reported from Ironton in 1884: North Lewisburg, 99°.3, on the 21st; Waverly, 99°.5, on the 20th; Ohio State University, 101°.0, on the 21st; Logan, 100°.0, on the 20th; Pomeroy, 100°.8, on the 20th. While the lowest maximum reported was 89°.0, on the 20th and 21st, at Jefferson, Ashtabula county; the minimum temperature for the month, 40°.0, was reported from Ironton, on the 1st; this is 3°.0 below the minimum for July, 1883, and 1°.0 below that of 1884.

State summary.

Mean barometer, 29.98 inches; highest barometer, 30.28 inches, on the 18th, at New Bremen; lowest barometer, 29.61 inches, on the 13th, at Oberlin; range of barometer, .68 inch.

Mean relative humidity, 74.1 per cent.

Mean temperature, 75°.2; highest temperature, 101°.0, on the 21st, at Ohio State University; lowest temperature, 40°.0, on the 1st, at Hanging Rock; range of temperature, 61°.0; mean daily range of temperature, 22°.8; greatest daily range of temperature, 43°.0, on the 4th, at New Bremen; least daily range of temperature, 6°.1, on the 18th, at Cleveland, and on the 22d, at Sandusky.

Average number of clear days, 12.8; average number of fair days, 14.5; average number of cloudy days, 3.7; average number of days on which rain fell, 11.6; greatest number of days on which rain fell, 15; least number of days on which rain fell, 4.

Mean rainfall, 3.20 inches; average daily rainfall, .103 inch; greatest rainfall, 5.69 inches, at Hudson; least rainfall, 1.23 inches, at Ainger.

Prevailing direction of wind, southwest.



Low-Barometer Areas. July, 1885

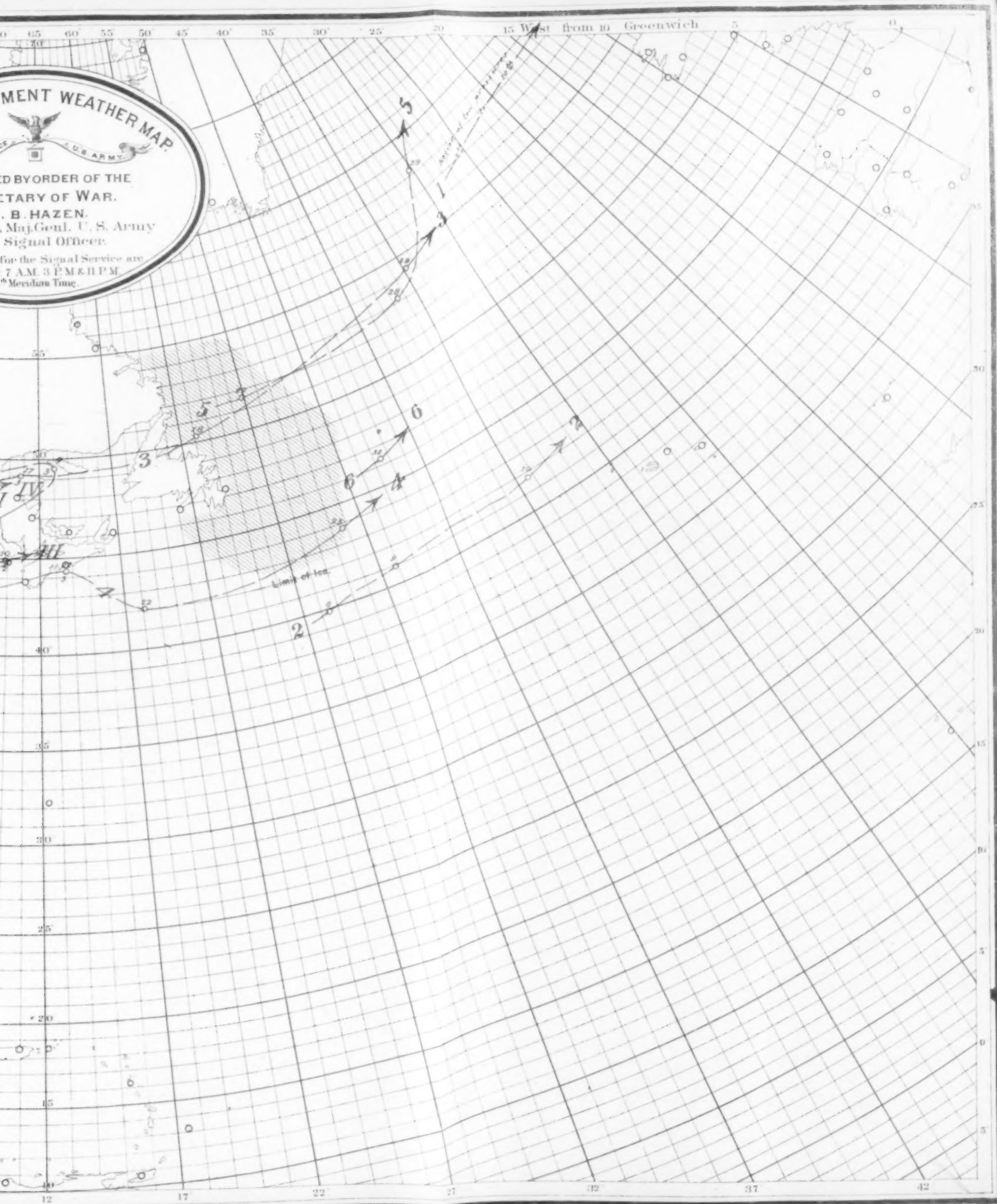


Chart II. Isotherms, Isotherms, and Winds, July, 1885

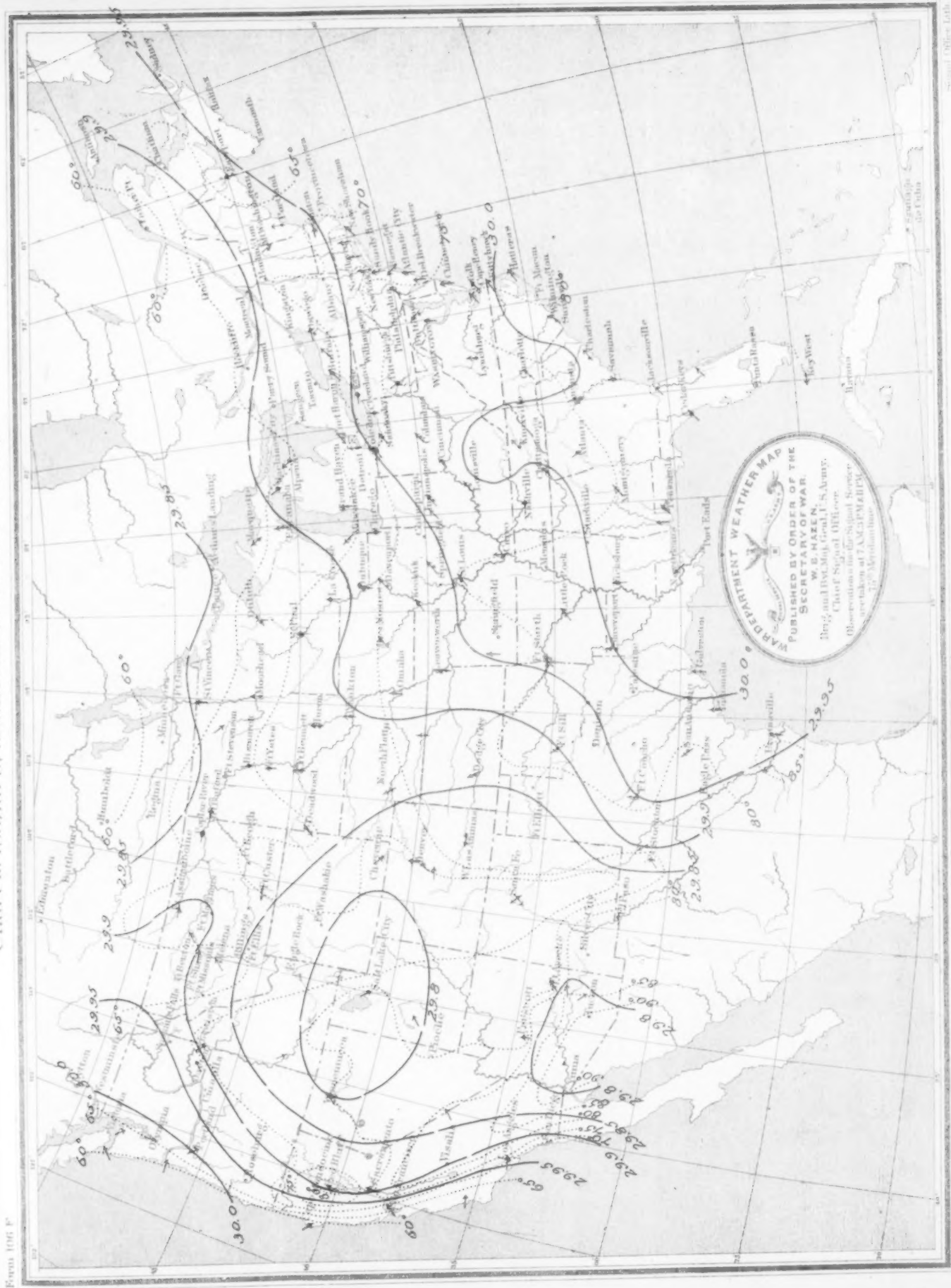
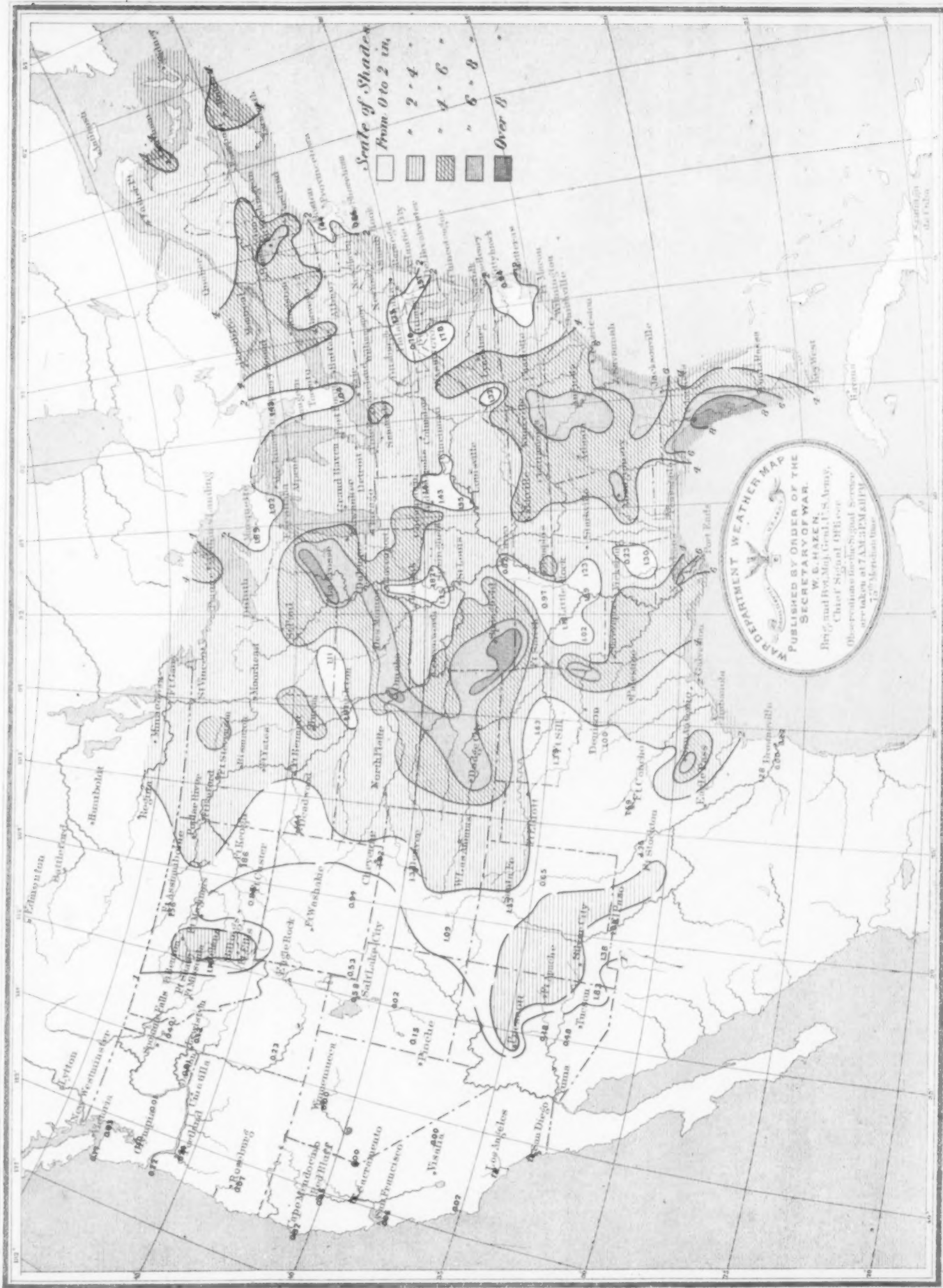
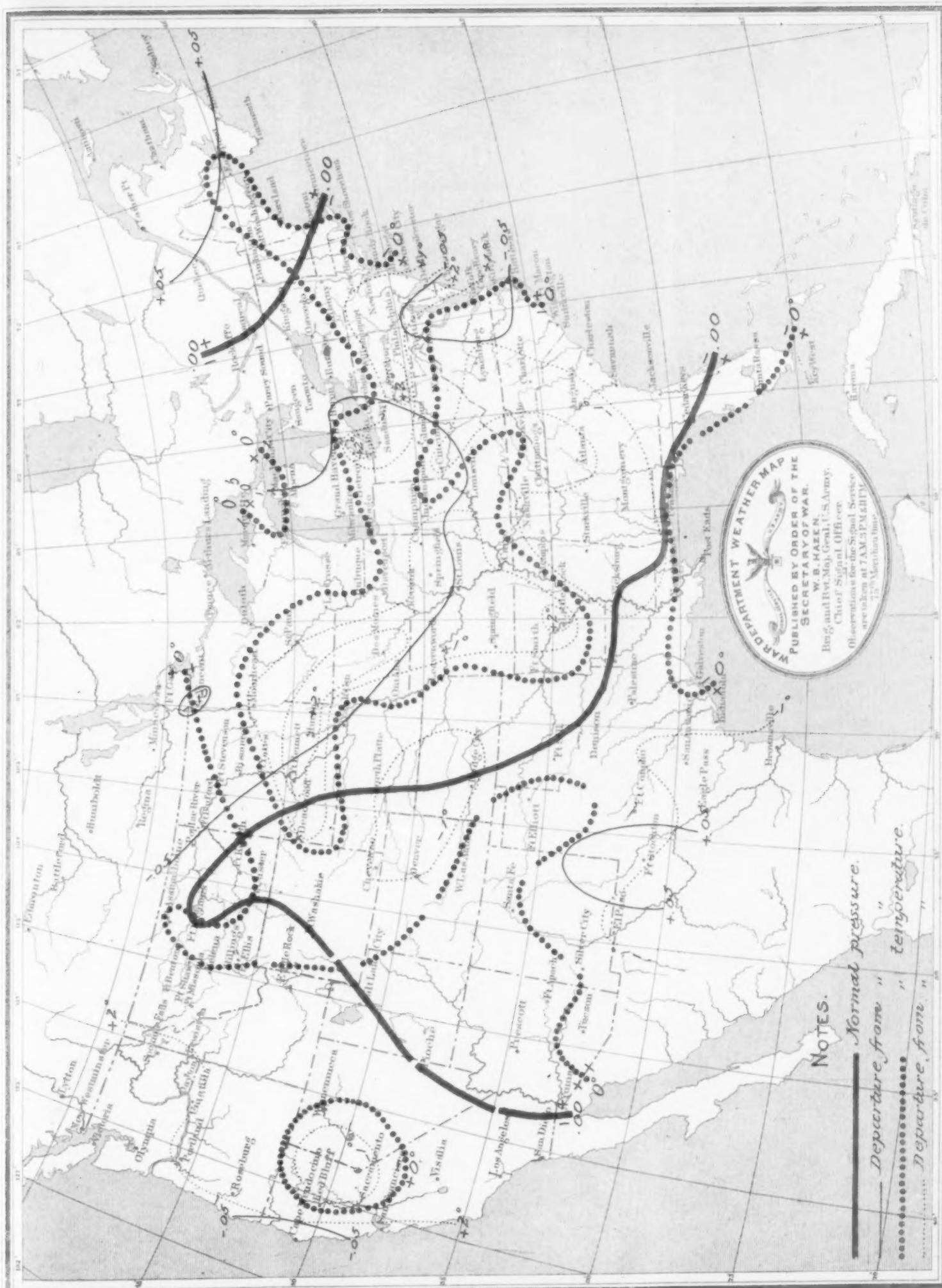


Chart III. Precipitation, July, 1885.



NAVY DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE
SECRETARY OF WAR.
W. C. HAZEN,
Brig. and Maj. Genl. U.S. Army,
Chief Signal Officer
Observations for the Signal Service
are taken at 7 AM P.M. and 11 P.M.
15th Meridian Time



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Voluntary observers of the Signal Service, on land, from whom meteorological reports were received in time to be used in the preparation of the Monthly Weather Review for July, 1885.

Observer and place of observation.	Observer and place of observation.	Observer and place of observation.	Observer and place of observation.
Andrews, L., Southington, Conn.	Day, Theodore, Dyberry, Pa.	Jones, Dr. E. U., Taunton, Mass.	Shriver, Howard, Wytheville, Va.
Anderson, Dr. W. W., Stateburg, S. C.	Dawson, Wm., Spiceland, Ind.	Jones, F. M., Puerto de Luna, N. Mex.	Samostz, Oscar, Austin, Tex.
Altner, J. M., Independence, Kans.	Dunton, Lieut. W. R., Dorset, Vt.	Jordan, Dr. M. D. L., Milan, Tenn.	Shahan, Chas. C., Columbus, Nebr.
Adams, Dr. O. H., Vinland, N. J.	Davenport, C. B., North Stamford, Conn.	Jones, Ira B., Neillsville, Wis.	Shepard, E. M., Springfield, Mo.
Abbott, Dr. E. K., Salinas, Cal.	Dow, Roswell, Sycamore, Ill.	King, L. M., Santa Rosa, Cal.	Smith, H. D., Monticello, Iowa.
Alexander, S., Birmingham, Mich.	Dudley, C. B., Altoona, Pa.	Knapp, J. G., Limona, Fla.	Safford, A. T., Williamstown, Mass.
Arents, Hiram, Oroville, Cal.	Duton, Hosea, Woodstock, Vt.	Keese, G. Pomeroy, Cooperstown, N. Y.	Sherman, W. B., Manchester, Iowa.
Beans, Thos. J., Moorestown, N. J.	Dunlap, J. B., Charleston, Ill.	Kuhne, F. W., Fort Wayne, Ind.	Smith, Rev. D. W., Troy, Pa.
Ballou, Dr. N. E., Sandwick, Ill.	Dechant, Wm. H., Mahanoy Plane, Pa.	Keeler, W. F., Mayport, Fla.	Staudenmayer, Dr. L. R., Lincoln, N. C.
Boynton, John F., Syracuse, N. Y.	David, V. E., Buchanan, Mich.	Kirkwood, E., Maury, Ind.	Snell, Miss S. C., Amherst, Mass.
Bayerly, J. F., Spartanburg, S. C.	Ellason, W. A., Statesville, N. C.	King, W. R., Yellow Springs, Ohio.	Shaw, E., Maud, Kans.
Bennett, Geo. Bandon, Oreg.	Eckstein, Rev. M., Conception, Mo.	Kent, Miss E., Phillipsburg, N. J.	Sim, John R., Summit, Va.
Beloit College, Beloit, Wis.	Ellis, John, Marquette, Nebr.	Lueps, Miss Anna, Manitowoc, Wis.	Sadler, Prof. H. E., Emporia, Kans.
Beil, Joseph, Franklin, Pa.	Ellsworth, W. W., Hartford, Conn.	Lincoln, A. T., Marion, Va.	Spilman, J. J., Pierce City, Mo.
Brainerd, Dr. H. G., Independence, Iowa.	Everett, Dr. J. T., Clyde, Ohio.	Loomis, J. C., Jeffersonville, Ind.	Stone, W. E., Amherst, Mass.
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